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AN OPERATION FOR THE TOTAL REMOVAL OF CEREBELLOPONTILE (ACOUSTIC) TUMORS

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POTENTIALLY benign lesions, usually easy of recognition, not difficult of operative approach or even of enucleation, nevertheless tumors of the cerebellopontile angle[1] have presented surgical problems which have seemed well-nigh insuperable. Surely few lesions have enticed surgeons with more alluring prospects and have ultimately yielded so little reward for their best efforts for, with few chance exceptions, patients have succumbed following total or attempted total extirpation of the tumor. At the beginning of the twentieth century it seems probable that there had been but one tumor of this kind completely and successfully extirpated—one removed by Ballance (2) in 1894 and reported in 1907. Although there is some uncertainty as to the exact nature of this tumor (he terms it a fibrosarcoma), it seems highly probable that it was really one of the true cerebellopontile variety. It was clearly an encapsulated tumor in this region, shelling out readily with the finger, and the patient's survival for many years is alone sufficient evidence to preclude a sarcoma. Moreover, as most of these tumors in earlier years have been recorded as gliosarcomata—a classification well justified by the histological picture—such an entry is evidence in favor of the tumor being of the cerebellopontile variety.

At the beginning of the twentieth century cerebellopontile tumors were recognized by their more or less characteristic signs and symptoms and became a fairly well established clinical entity. Oppenheim of Berlin, Sternberg of Vienna, v. Monakow of Zurich, Hughlings Jackson and Gowers of London, Babinski of Paris, and Allan Starr of New York, were not only pioneers in the recognition of these tumors but they stimulated a group of surgeons to undertake their removal.

At the International Congress of Medicine in London in 1913, the three great European surgeons—Horsley of London, v. Eiselsberg of Vienna, and Krause of Berlin—who had in such large measure been responsible for the birth and growth of brain surgery, presented their results on the extirpation of cerebellopontile tumors to that date. Horsley had 10 operative deaths in 15 cases (67 per cent), v. Eiselsberg 13 deaths in 17 cases (77 per cent), and Krause 26 deaths in 31 cases (84 per cent). Krause admitted they yielded the poorest results of all his brain tumors. There seems

[1] This group of tumors has long been recognized as a distinct clinical and pathological entity. Various other tumors in this region, whether encapsulated or infiltrating, have not been considered. I prefer the designation "tumors of the cerebellopontile angle"—the Kleinhirnbruecken-winkeltumoren of the Germans—rather than "tumors of the acoustic nerve" for this well known group of encapsulated tumors because it does not include a theory of origin. Both appellations are defective—"cerebellopontile angle" because it merely denotes a location which is the abode of other tumors of varying types; and "acoustic" because the origin of the tumor is still in dispute and also because there are other tumors of the acoustic nerve which, both in structure and position, are entirely unlike those under consideration. Throughout the remainder of the paper the abbreviated term "cerebellopontile tumor" will be used. Though even less accurate, it has attained significance through general usage and has obviated the tendency to use the clumsy and grammatically incorrect expression, cerebellopontile "angle" tumor.

to have been no very great difference in the methods of attacking the tumor. Each used a unilateral cerebellar approach, often little more than an enlarged trephine opening, and the tumor was quickly shelled out with the index finger or spatula. Because of the disastrous results, the operation was often performed in two stages, particularly by v. Eiselsberg and Horsley. Sometimes Krause used suction to draw the tumor from its bed.

The conference ended with no prospect of better operative results in the future. In the hasty and necessarily blind extirpation of these tumors through a totally inadequate exposure, many of these tumors were broken and only partially removed, necropsy revealing more or less tumor undisturbed. Moreover, those few patients who survived were almost without exception badly crippled. So far as I am aware, the ultimate results of the few successes of Horsley, Krause, and v. Eiselsberg were never published, but a fortunately timed publication of Tooth (18) at the same International Congress in London, 1913, presents a comprehensive statistical study of the operative results in all brain tumors from the National Hospital of London to the date of this conference (1913), and appended thereto is a brief summary of each case together with the operator, operation, and, so far as known, the ultimate results. If not including all of Horsley's work, this report at least gives us a fair insight into his results. From this dismal story we learn much concerning the fortitude of these great pioneer brain surgeons who nevertheless persevered to blaze a trail through a forest which must have seemed utterly impenetrable. Looking back, it is clear that they were ill equipped for such a struggle; until the latter part of their work surgery was yet in its infancy. Cranial surgery offered technical problems foreign to those of other tissues; instruments of special character had to be devised; the control of hæmorrhage from bone, the brain, and tumors, was unlike that elsewhere. A knowledge of the functions of the various parts of the brain and of the cerebrospinal fluid was only slowly accumulating. The effects on intracranial pressure of the immediate injury to cerebral tissues were at best imperfectly understood; and the avoidance of trauma continued to be almost impossible because technical difficulties prevented sufficient exposure of the desired field. Moreover, sepsis continued to exact a not inconsiderable toll. Though Horsley, v. Eiselsberg, and Krause were all firm adherents of the Listerian principles of combating infection, the avoidance of infection had not been mastered. And, last but not least, neurology was also just developing so that the diagnosis of tumors was usually made when the patient was blind and often *in extremis*. Cerebellopontile tumors, however, had one great advantage over all other brain tumors: not only could fair diagnosis and localization be made with fair accuracy, greater as time passed, but the tumor was known beforehand to be benign and encapsulated. The surgical problem, therefore, was direct.

With a minimum of scientific equipment, the struggle for solution of this surgical problem was necessarily in large part through trial and error, but the great Horsley early added to neurological surgery the far reaching and invaluable method of animal experimentation, but shortly before begun by Fritsch and Hitzig in Germany and by Ferrier in England.

One hardly knows whether to admire the indomitable courage of the surgeon or the persisting faith and hope of the neurologist the more. The story contained in these struggles differs only in degree from that of the pioneer efforts in advancing the frontiers of knowledge. It is, therefore, without possible taint of a critical attitude that the statistics of Sir Victor Horsley are studied. Without his contributions, both technical and physiological, to this field of surgery—his bone wax, his method of controlling hæmorrhage with pieces of excised muscle, and his introduction of decompressions in order to combat acute postoperative intracranial pressure, etc.—it would not yet be possible to cope with the many problems of intracranial surgery.

Returning to Tooth's analysis of operations for tumor, we find under the heading "Extracerebellar Tumours—Removal of tumour, complete or partial," 12 cases of cerebellopontile tumor operated upon by Horsley.[1]

[1]In grouping these cases as cerebellopontile tumors, I have taken the liberty of disregarding Tooth's histological classification of tumors

From this group of cases, 5 (42 per cent) survived the operation for periods of 6 weeks, 2½ months, 3 years, 3 years+ and 8 years+; of these, 3 died of recurrence at the times stated, 1 had signs of recurrence at the end of 3 years (the wound was bulging and tight) and the last case was well and active 8 years after the operation. Of the 7 deaths (58 per cent), 2 were from meningitis on the sixth and seventeenth days. It is evident that Horsley has included in his own mortality statistics two deaths which occurred at 6 and 10 weeks, and included in his living cases one which lived 11 months after removal of a tumor on one side and died following extirpation of a second growth in the other angle, a case almost surely of Recklinghausen's disease and not of cerebellopontile tumor. But the most important result in Horsley's series is not his mortality rate but the report of the necropsy findings. Of six necropsies, in only one case had the tumor been totally extirpated, the remaining five showing more or less tumor still undisturbed. In two cases the cerebellar lobe had been very badly damaged.

Tooth's remarks on the results following extirpation of these tumors (including 5 cases operated upon by other surgeons at the National Hospital without a single recovery), well express the situation and faint degree of hope at that time. "The diagnosis of tumours in this region is so comparatively easy and accurate, and the surgical treatment at first sight so straightforward, that the results in this table are disappointing in the extreme. . . . No doubt the proximity to the vital centres is accountable for great shock, with respiratory and cardiac failure. If the danger of that period can, by any alteration in surgical procedure, be eliminated, there is no reason evident why these cases should not do well."

Nor had this impression of the surgical treatment of cerebellopontile tumors changed in England during the following 10 years, if we may judge correctly from the following quotation from Gordon Holmes (11), when discussing a case presented by Walshe (20) before the Royal Society of Medicine: "It was perhaps presumptuous on his part to refer to the surgical treatment, but so many of his cases had passed through the hands of surgeons that he had had some experience in the matter. He had seen one case recover only after gross removal of the tumour, a man upon whom Sir Victor Horsley operated many years ago, but though he lived for several years he was seriously crippled.[1] The danger seemed to be that total removal necessarily meant a disturbance of the vascular supply on the same side of the pons and medulla; the man to whom he referred had, after the operation, the characteristic symptoms of softening in the lateral side of the pons. He saw a few other cases which had survived operation for a week or so after total removal of the tumour, and all showed evidence of acute bulbar involvement."

The aggregate number of total extirpations of these tumors with recovery to date and freedom from recurrence, is impossible to estimate but with liberal allowance it will probably be less than half a dozen—and we are positive of only two. Foremost of these cases is the one removed by Ballance (2) in 1894. Apparently the only permanent sequelæ of the operation many years later were palsies of the fifth and seventh nerves; the former had resulted in corneal ulceration and loss of vision in that eye. The second undoubted cured case is that of Horsley. From Eiselsberg's series (9) of four recoveries (including one by his assistant, Clairmont) from the operation, one was able to resume work on the farm but there is no other record noting the ultimate results and freedom from recurrence. Leischner (13) collected from the literature eleven cases which had survived operation. Among these were four from Eiselsberg's Clinic, one of Horsley's (this was before Horsley's report (1913) of five recoveries), Krause (12) one, Poppert (16) one, Baisch (1) one, and Borchardt (3) three. This ensemble, however, is of little significance; they should not be confused with cures, for aside from the

(glioma, fibroglioma and fibroma) and including those tumors which, from the history of the patient (early deafness with other symptoms appearing late) and even more the gross appearance of an encapsulated enucleable tumor in the angle, appeared to me probable tumors of this variety. For example, Case 222, entered as a glioma by Tooth, impressed me more as being a cerebellopontile tumor, and two cases of bilateral tumor classified by Tooth as fibroglioma, I have excluded, feeling that they were probably rather examples of Recklinghausen's tumors. I have also included four of Horsley's cases grouped under fibromata. As Horsley refers to fifteen cases at the same meeting, it is fair to assume that he and Tooth (who includes fourteen) refer to the same cases.

[1] Doubtless this reference is to the same patient whom Tooth (1914) mentioned as living and well (with V and VII paralysis) 8 years after operation.

cases of Ballance and Horsley, and possibly the one of Eiselsberg's, the subsequent evidence of their cure has not appeared. In the light of the necropsy reports in Horsley's cases, in which but 1 of 6 cases was shown to be totally removed, it would appear fair to presume that few if any of these had been totally extirpated and the patients permanently cured. One of the best results reported in this group of tumors was by Willy Meyer of New York (14, 1912). In two stages, 4 weeks apart, this tumor was removed with a spoon. Three years later he was apparently well, but we have been unable to find subsequent notes on this patient's condition.

The operative method used by all operators was essentially the method of Horsley, v. Eiselsberg and Krause. A two-stage procedure came to be used almost universally and usually the dura was not opened in the first step. It seems probable, however, from Tooth's reports that Horsley always opened the dura and, toward the last at least, his decompression was bilateral. The unilateral exposure of the affected side of the cerebellum was used by Krause and v. Eiselsberg. Krause (12), it is true, suggested a bilateral cerebellar approach, but it was designed for exploration of the posterior fossa and was not intended to be used when the tumor was known to be in the cerebellopontile angle. It appears that in many instances the opening in the occipital bone was but little larger than necessary to insert the finger or spatula. The tumor was removed by sweeping the finger or spatula around the tumor and making the traction necessary to dislodge it. The finger was preferable for it could better detect the cleavage plane between tumor and brain stem. After such extirpations, furious bleeding must have been inevitable. Always the lobe of the cerebellum was injured, often much of it destroyed, and at times even deliberately removed. Not infrequently the tumor was extirpated through a transcerebellar defect which reached the upper surface of the tumor. Frazier (10, 1905) indeed urged deliberate resection of the outer part of the cerebellar hemisphere and, though a heroic procedure, it probably caused no greater damage to the lobe than that which customarily resulted from these extirpations.

Krause (12, 1903) introduced a very useful procedure to reduce the excessive pressure which was nearly always present with cerebellopontile tumors. A trocar was passed through the tentorium into the lateral ventricle permitting the evacuation of its fluid. This procedure (ventricular puncture), in much more refined form, has come to be a most important item in all operations for tumors below the tentorium.

Perhaps the translabyrinthine approach suggested by the otologist Panse (15, 1904) should be mentioned in passing. At the time this method was proposed, attempts to remove cerebellopontile tumors appeared utterly futile and any suggestion might at least be tolerated. But it was a wholly impractical suggestion. After destroying much of the petrous bone, including the labyrinth and much of the mastoid bone and its contained air cells, and after passing through fields which could not be sterilized and might well harbor dormant infections, the resulting exposure must necessarily have been so meager that it would hardly be possible to do more than nibble at these great tumors. Quix (17, 1911) hastily reported the removal of a pea-sized tumor by this method but the patient died a few months later. The usual large recess tumor was present; its surface had only been scratched! The one prerequisite of any operative approach is adequate room to afford thorough inspection of the tumor during its attack in order to permit the deliberate control of hæmorrhage. This exposure being lacking in the translabyrinthine approach, other consideration of the procedure is useless.

Inevitably a severe reaction must appear against attempts to remove cerebellopontile tumors, particularly as the gamut of possibilities, both of method and of individual skill, had apparently been run. All of the accumulated technical advances of a quarter of a century had made no improvement in the results. At any rate, the continuance of an operation carrying such an astounding mortality after such an exhaustive trial, was impossible.

The reaction came with the publication, in 1917, of Cushing's (5) important monograph on acoustic tumors, and with it a revolution in

treatment. He accepts the only conclusion which the foregoing results and experiences of his own could justify, i.e., "I doubt very much, unless some more perfected method is devised, whether one of these tumors can with safety be totally enucleated." He no longer attempted to enucleate these tumors totally but was content to offer a method by which the tumor could be *partially* removed (intracapsular enucleation).

Cushing's contribution is the only important advance in the treatment of cerebellopontile tumors. For the first time the patient was offered a relatively safe surgical procedure with prospects of temporary relief and prolongation of life, in lieu of a hazardous and desperate effort carrying permanent disability in the wake of the very occasional chance recovery. In the first series of operations his mortality rate was reduced to 35 per cent, and in a subsequent series of about equal number to 11 per cent.

But intracapsular partial extirpation is far from satisfactory, for the growth must always recur. Partial removal of the tumor, even when the growth develops slowly, can never be considered a final operation for a potentially benign tumor.

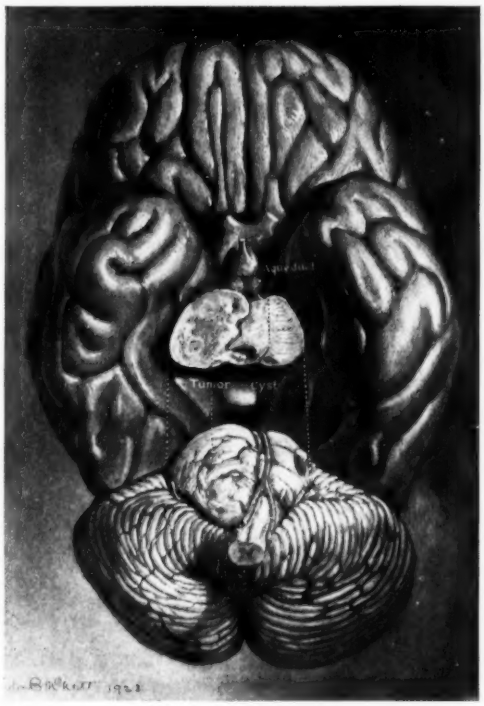

Fig. 3. Drawing of cross section of tumor and brain stem at the mid-brain level. The severe effect upon the brain stem is shown. Not only are the pons and the medulla markedly displaced to the opposite side, but the nodulations of the tumor have produced great loss of the brain stem. Such irregularities are doubtless responsible for focal disturbances which are at times associated with cerebellopontile tumors. Hydrocephalus, an inevitable sequence in the late stages, results from dislocation and obliteration of the aqueduct of Sylvius. This particular tumor shows a bridge of attachment to the brain stem, even as far anterior as the mid-brain, but the microscopic picture is identical with that of other tumors of this group. This patient died at stool a few hours before the time scheduled for operation.

THE DEVELOPMENT OF AN OPERATIVE PROCEDURE FOR THE TOTAL REMOVAL OF CEREBELLOPONTILE TUMORS

The purpose of this communication is to present an operative procedure by which it has been possible to remove the entire cerebellopontile tumor in a group of cases. Admittedly, it is a procedure of magnitude and carries potentialities of great danger. However, with care and attention to detail the mortality may not be greater, and not improbably even less, than Cushing's partial intracapsular enucleation. The method has been gradually evolved from the failures of other operative procedures. Finally it was forced upon us in an effort to avert an impending death several days following the partial (intracapsular) operation.

Our operations on cerebellopontile tumors cover the past 9 years. At the present writing the series consists of 23 tumors, the results of which are included in Table I under the various methods of operative attack. One case, apparently well on admission, died at stool a few hours before the time scheduled for operation. In a general way the order of the grouping is also chronological, though this is not strictly true. Our operations began at a time (1915) when the results of attempted enucleations were known, but our efforts were necessarily directed along the more or less generally recognized methods of operative attack. The initial attempts at a simple suboccipital decompression met a sharp and entirely un-

Fig. 4 (left). Patient 3½ years after total removal of cerebellopontile tumor. She has never been willing to have a spinofacial anastomosis performed to correct the facial paralysis.

Fig. 5. Patient one year after total extirpation of tumor. A spinofacial anastomosis performed shortly afterward has largely overcome the facial deformity. The tumor was on the right side. We see patient's ability to close the eyelids and draw the corner of the mouth after spinofacial anastomosis (right side).

Fig. 6 (left). Another patient 18 months after extirpation of tumor, showing good return of facial function after spinofacial anastomosis.

Fig. 7. Showing the right facial movements which have returned after total removal of a right cerebellopontile tumor. Elevation of the shoulder brings out the maximum effect due to the associated movement.

expected reverse and dispelled at once our pre-existing impressions of the value of this procedure as a palliative measure. Two cases so treated died within 12 hours, postmortem examinations revealing no hæmorrhage or other cause in either instance. Although the intracranial pressure was well advanced in both patients, each was conscious and in good physical condition at the time of operation. Disregarding for the moment the explanation of these deaths—now better understood—it is at least evident that this comparatively simple procedure has been accompanied by great danger and has in nowise helped to solve the problem of removing the tumors.

In desperation, our next effort, total extirpation with the finger at one stage, then seemed the only alternative. It was, of course, merely a reversion to the well tried and fruitless method of Horsley, Krause, Eiselsberg and others. Nor was there reason to expect better results. After two initial successes, four deaths in succession showed the futility of further attempts. It is of little concern that one case is well 5 years later, and the fate of the other after leaving the hospital is unknown. The results are of interest and importance only in that their careful analysis did explain the causes of death and therefore suggested methods of avoiding them.

At this time of despair, Cushing's method of intracapsular enucleation was introduced. Its great improvement over other procedures was at once obvious. Despite enthusiastic hopes, however, our first experiences with intracapsular enucleation were unfortunate in being less satisfactory than had been anticipated. Following an uneventful and quick recovery from the effects of the operation, the first patient 7 days later became listless and drowsy; vomiting, dysphagia and dysarthria appeared; and during the succeeding 3 days all symptoms became progressively worse and finally alarming. The late appearance of these symptoms seemed to exclude the postoperative complications which might have been expected, hæmorrhage or infection, and suggested that in some way the reaction about the stump of tumor which remained was responsible for the condition. The wound was reopened and the shell of tumor extirpated with the index finger. There was surprisingly little hæmorrhage, which was readily controlled. The patient's condition then steadily improved. Diminished drowsiness was at once apparent, the vomiting at once ceased, and 5 days later she was able to swallow. From the result of this case it seemed logical to infer that if the shell of the tumor could in some way be removed at the first operation, this stormy and dangerous course following subtotal removal might be avoided. In the succeeding cases in which the tumor has been removed at one sitting, the results have amply supported this inference.

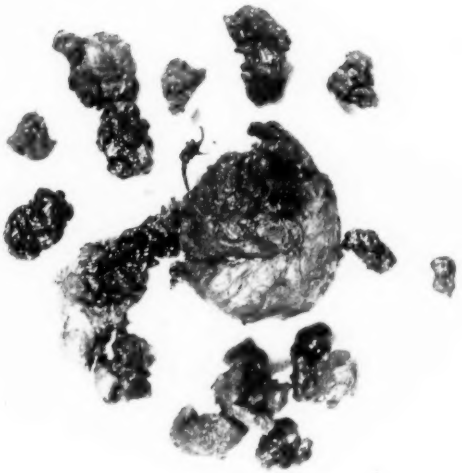

Fig. 8. Fragments of tumor removed by intracapsular method. The large mass is the upper pole which projected through the incisura tentorii. This is the most inaccessible and, from the standpoint of relief, the most important part of the tumor; upon its removal depends the release of the occluded aqueduct of Sylvius. In later cases the interior of this pole has been more thoroughly curetted, making the capsular removal easier and safer.

Fig. 9. Grouping of fragments of the tumor removed by the curette. By draining the capsule forward the interior of the tumor can be deliberately curetted for the brain stem is always exposed to view. The size of the extirpated fragments then becomes more uniform.

THE OPERATION (6)

Needless to say, the success of this procedure is dependant not only upon many technical advances which have been slowly accumulating, but also upon a clearer understanding of intracranial physiology and pathology. Without Horsley's bone wax or Cushing's silver "clips," without Horsley's principle of decompression to take care of postoperative traumatic œdema, without the bilateral cerebellar exposure (probably originated by Cotterill, 4) which allows more room for exposure and for decompression, and finally without Cushing's intracapsular method of removing the body of the tumor, the removal of the capsule of the tumor could hardly be accomplished.

A bilateral cerebellar approach, which has become more or less a regular practice for all cerebellar lesions, is first made and the bony and dural defect extended laterally and superiorly on the side of the tumor as far as the transverse and lateral venous sinuses will allow (Fig. 11). Because of the great depth of the tumor, an ordinary bilateral cerebellar approach alone would not afford the direct inspection and lengthy manipulation which is necessary to dissect the growth from its bed. Indeed, in a survey of Cushing's cases, there are instances in which the tumor was missed at the first operation because of insufficient exposure, and there are other cases in which the tumors were found only by transecting the cerebellar lobe. Attempts to expose the tumor with an insufficient removal of bone causes serious injury to the brain from retraction. Always the mastoid cells are brought into view, but unless the easy exposure of the tumor makes imperative demand, their entrance is avoided. But when opened the cells are at once covered either with a sheet of wet cotton or by reflected dura (Fig. 12) which is sutured to the galea or trapezius muscle. The history of a mastoid infection would give great concern, and every other possibility of the tumor's exposure would be attempted before yielding to an easier approach which open-

Fig. 10. Roentgenogram (anteroposterior view) showing cluster of silver clips, each representing a ligatured vessel. They also demonstrate how nearly the tumor approaches the midline.

ing hitherto infected cells would provide. The anterior part of the bony extension is carried under the attachment of the trapezius muscle but the continuity of this muscle with the galea is carefully preserved. A good exposure of the entire superior surface of the cerebellum is important in providing a good exposure of one large vein (Fig. 11) which bridges the space between the superior surface of the cerebellum and the tentorium which it enters en route to the transverse sinus. Unless ligated and divided beforehand, this vessel may easily be stretched and torn in elevating the cerebellar hemisphere and in exposing the tumor. There is less danger of such injury to the contralateral symmetrical vein, and similar precautions against its injury are not necessary. Needless to say, special care is taken to avoid incising either the lateral or sigmoid sinuses, particularly the latter.

Almost without exception, the dura has been so tense that it has been necessary, or at least advisable, to relieve pressure in the dilated ventricles, tapping and withdrawing fluid from the posterior horn of a lateral ventricle. Hydrocephalus invariably results when the tumor has occluded the iter (Fig. 3), and few tumors appear for operation before this phase of the tumor's progress is well established. Before removing the ventricular needle, gentle pressure can, if desired, be applied to the intact dura and additional relief of pressure which is exerted upon the posterior fossa will follow the further escape of fluid which is afforded by the upward push of the tentorium. In every case of hydrocephalus from cerebellar lesions, the intracranial pressure above the tentorium can be reduced to that of the atmosphere by this simple expedient and without danger of injury to the brain stem.

After this preliminary measure, gentle elevation of the cerebellar lobe quickly brings the tumor into view, though at a great depth (Fig 12). Another invariable finding in all cases of cerebellopontile tumors is the partial or complete obliteration of the cisterna magna, the cerebellar tonsils projecting through the foramen magnum into the spinal canal (Figs. 11 and 12). If, however, the cisterna does still contain fluid, its release again contributes that much more room to the all-important exposure of the tumor. An encapsulated bed of fluid (having no communication with the subarachnoid spaces) may or may not crown the outer and superior surfaces of the tumor and, though largely or entirely obscuring the tumor, its presence is almost as characteristic of an underlying cerebellopontile tumor as the direct inspection of the neoplasm itself. Further elevation of the cerebellum brings the unattached outer surface of the tumor into full view and into a position where it can be subjected to an operative attack. Excepting the poles which have passed beyond the confines of the posterior cranial fossa (through the incisura tentorii and the foramen magnum), the entire longitudinal extent of the tumor is brought into full view. The capsule is then incised longitudinally from pole to pole (Fig. 12) and much of the outer contents removed piecemeal with a curette after the method of Cushing (Fig. 13). The capsule is then picked up at the margins of the opening in the tumor, drawn forward with forceps, and the attached surface of the capsule brought into view

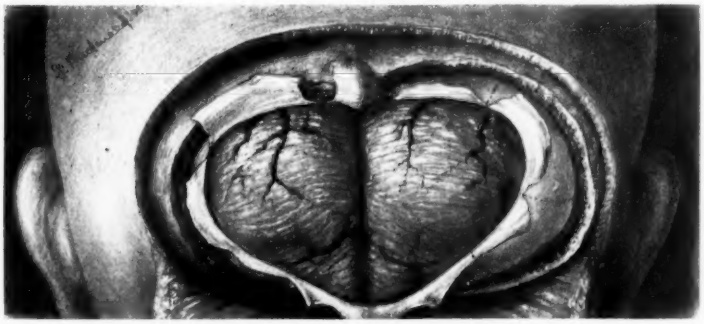

Fig. 11. The bony defect of the usual bilateral cerebellar approach is considerably enlarged on the side of the tumor, as far as the transverse and lateral sinuses. The exposed dura on the right indicates the additional bony removal obtained in this way. Incision of the dura along the dotted lines affords much additional room for exposure of the tumor.

(Fig. 14). The contents of the tumor are then curetted with the brain stem and cerebellum always fully exposed. Continuing this method, the capsule gradually becomes thinner and when drawn forward permits inspection of the cleavage line between the brain stem and capsule of the tumor. When the poles of the tumor have invaded the middle cranial fossa and the spinal canal, removal of their interior allows them to be easily withdrawn into the posterior fossa; such polar extensions of the tumor are least adherent to the brain stem. Gradually in this way the entire capsule is separated from the brain stem. As the capsule is cautiously retracted, several small blood vessels crossing from the brain stem or cerebellum are brought into view and doubly "clipped" and the vessel divided. Practically all bleeding can be forestalled in this way (Fig. 10).

Removal of the capsule of the tumor in this way is necessarily very tedious and time consuming. The method employed is but the application of the fundamental surgical teachings of my former chief, the late Professor Halsted. By this great master every operation, whether unusual or commonplace, was performed with the utmost care. All tissues were handled with the greatest gentleness, the field unstained with blood, and a step was never taken blindly. Always his work was painstaking, the field of operation immaculate, and hæmorrhage minimal. Time of operation was always subordinate to accurate and thorough performance.

It is clear that as a measure preliminary to removal of the capsule, the intracapsular curettement must be carried out much more thoroughly than when this procedure is the end-result. When the tumor is curetted blindly, i.e., with only the outer aspect of the growth in view, the total amount of tumor removed, though seemingly great, will be relatively small, for the danger of penetrating the capsule and injuring the brain stem with the curette is always uppermost in the operator's mind, and in avoiding this possibility it is more probable that too little rather than too much will be removed. The more thoroughly the capsule is stripped of its solid contents (up to a certain limit), the easier becomes the final stage of its separation from the brain stem. It should not be inferred that the separation of the capsule is not attended by difficulties. It is always difficult and frequently for some time seems impossible. Only by persistently tugging at the capsule, often gaining but a millimeter at a step, does its attachment finally yield.

In one of the earlier cases the ultimate release of a fraction of the capsule seemed impossible of accomplishment and was given up. It is quite probable that with increasing experience and confidence this capsule could now be removed. On the other hand, only quite recently the capsule in another case was so

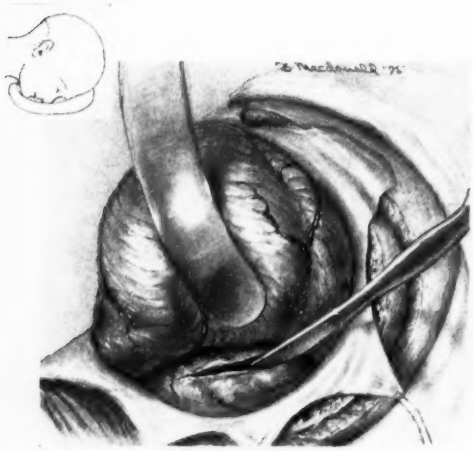

Fig. 12. The entire length of the tumor is exposed when the cerebellum is retracted. Throughout the operation this exposure is maintained. The outer surface of the capsule is incised almost from pole to pole.

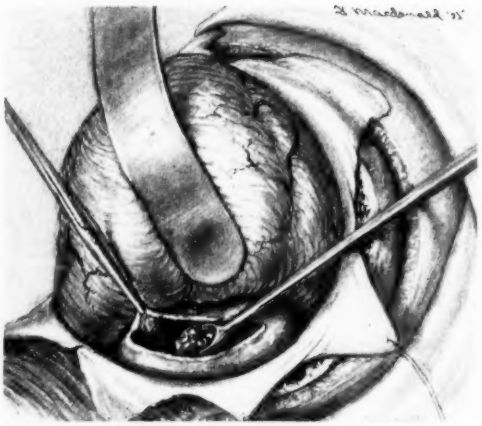

Fig. 13. Intracapsular removal of fragments of the tumor with a curette (after method of Cushing).

delicate that at every attempt at traction it tore and when there seemed no way to overcome this difficulty in desperation the capsule was shelled out with the index finger. There is, however, a marked individual difference in the degree of attachment of the tumor to the brain stem, and there will probably always be instances in which a deliberate and painstaking removal will not be possible.

When the capsule is ultimately delivered, the denuded brain stem should and must be perfectly dry. A fatality will almost surely ensue if even the slightest ooze persists when closure is begun. Drainage has usually been avoided, though in two instances a rubber protective wick was placed in the lateral recess and removed in less than 24 hours.

The largest vessels encountered during the operation are the postero-inferior cerebellar and vertebral arteries which wind around the lower pole of the tumor and usually one and at times two branches to the tumor are given off from the former. These arteries are but loosely attached to the tumor and can easily be stripped from it after the branches have been divided. At the other pole of the tumor is a large venous branch of the inferior petrosal sinus. Closely applied to the tentorium and the tumor, from which it emerges, this vein may be very troublesome unless dissected free, ligatured and divided in the operation. Naturally the vessels causing greatest concern are the arteries which cross from the brain stem to the tumor. There are usually three to six of these vessels in addition to two or three from the inferior surface of the cerebellum. Though constituting probably the greatest danger of the operation, there is, however, no great difficulty either in exposing or ligating these vessels.

Removal of the tumor at a single stage is undoubtedly far preferable to two stages. Despite its great length (often 3 to 4 hours) the operation is usually well borne, and unless exceptionally difficult can be completed before lowering blood pressure or accelerating pulse gives warning of danger. Only once did the patient's condition necessitate abandoning operation and continuing at a second attempt. In three cases the capsule was intentionally left for a second stage (7 to 12 days later). In the interim the capsule had become so soft, swollen, and friable that the teeth of the forceps were no longer able to retain a grip and the capsule then had to be shelled out with the finger. If the capsule cannot be carefully extirpated at the first stage, its enucleation with the finger can undoubtedly be accomplished with greater safety at a second and not too distant stage, for the œdema of the tumor which remains, doubtless reduces the caliber

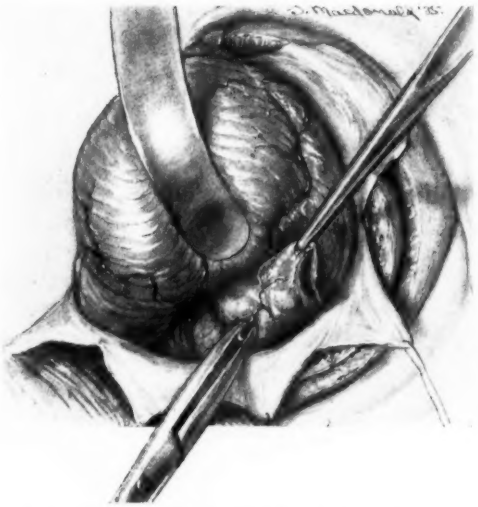

Fig. 14. Illustrating the method by which traction on the excavated capsule of the lower pole strips the remaining tumor from the brain stem and brings into view the vessels which cross from the brain stem.

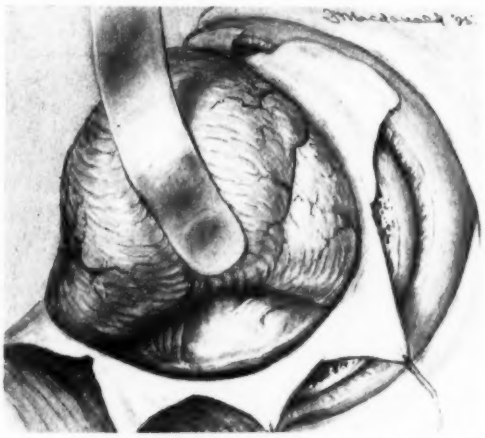

Fig. 15. Drawing made by Dr. Macdonald of the brain stem after the tumor had been completely removed. The several nerves (IX, X, XI, and XII) are intact posteriorly and the trigeminal nerve is compressed against the pons. In this particular case the largest vessel entering the tumor was ligated just dorsal to the origin of this nerve.

of the small arteries supplying it and greatly modifies the bleeding.

It is not the purpose of this communication to commend finger enucleation for these tumors. However, in those exceptional cases in which the capsule of the tumor cannot be liberated, I believe the removal of the capsule at a second stage to be superior in the ultimate, and at times in the immediate results, to the subtotal intracapsular enucleation alone. An excellent example of this impression is given in the patient previously mentioned. When, several days after intracapsular enucleation, stupor, vomiting, dysphagia, and dysarthria appeared and progressively increased, not only did she promptly recover and the symptoms quickly disappear after enucleation of the capsule with the finger, but she has since remained as well as any of those patients in whom the operation was completed by careful dissection in one stage.

The bond between the brain stem and tumor may be solely by connective tissue, but in one case at least the tumor has been found at necropsy to be a direct outgrowth of the brain stem (Fig. 3). It can hardly be denied that when the tumor is actually continuous with and a direct outgrowth from the brain stem its origin must be from the brain stem and not from the region of the porus acusticus, as has been claimed. But the origin of these tumors is another story which we shall consider at another time. The capsule has always been most adherent at the pons; in the single case in which a line of cleavage could not be followed throughout, the fragment of tumor remained tightly adherent at the pons.

Cerebellopontile tumors are only slightly adherent to the dural covering of the base of the skull, but the separation of the capsule nearly always leaves an oozing, raw surface, and at times an even greater degree of bleeding. At the porus acusticus, however, the attachment is always firm for the auditory nerve is an integral part of the tumor. This attachment has usually been liberated after the tumor has been separated from the brain stem, but in one case the dissection was begun at the meatus and in so doing it was possible to pick up and follow the facial nerve in the capsule, in which it was superficially located, to the brain stem. But in liberating the capsule from the pons, the nerve was accidentally torn. Greatly elongated by its stretch around the tumor, the facial nerve in this case was a

very delicate filament scarcely larger than an ordinary cambric sewing needle. In none of the other cases has the facial nerve been seen during dissection of the tumor. Should preservation of the facial nerve with total removal of the growth be ultimately possible, it could doubtless be more easily located at the internal auditory meatus. Its course is probably always, as in this case, on the under surface and toward the lower pole of the tumor.

The trigeminal nerve is always brought clearly in view during the dissection and throughout its intracranial course (Fig. 15). Usually it first appears when the upper pole of the tumor is withdrawn from the incisura tentorii or separated from the tentorium. But on one occasion when the dissection from the inferior pole proceeded with unusual ease, the nerve was first exposed at its junction with the pons; its exposure was then continued forward in the direction of the mid-brain. Being tightly squeezed between tumor and brain stem which it parallels (Fig. 2) the trigeminal nerve has been flattened like a ribbon. Its more distal course is determined by the upper pole of the tumor which pushes the nerve ahead, ofttimes into the middle cranial fossa, causing it to double back upon itself before entering the dural envelope surrounding the gasserian ganglion.

The remaining cranial nerves of the posterior cranial fossa (on the side of the tumor), though pushed aside and even somewhat elongated by the tumor, are much less seriously affected. Before the dissection is started, the spinal accessory nerve, most affected of this group, is often seen bending around the inferior pole of the tumor from behind, but in any case it is quickly brought into view when the inferior pole is drawn forward. The vagus and glossopharyngeal nerves appear in succession when the inferior pole is drawn a little farther forward. Never more than lightly attached to the growth, these nerves are pushed mesially and inferiorly, the distortion of each depending upon the size and configuration of this part of the tumor. In one case a tumor nodule projected between the spinal accessory and vagus nerves. The hypoglossal nerve, having a more mesially placed exit, is less disturbed by the tumor. This entire group of nerves fall away as the capsule of the inferior pole is dislodged (Fig. 14). Although the basilar artery has been exposed on two occasions, I have never recognized the abducens nerve.

We have carefully examined every porus acusticus after extirpation of the tumor, but in only two instances was there an appreciable widening of this opening. Not infrequently there was a rather diffuse concavity of the region surrounding the meatus, and in one instance a quite deep pit (about 1 by 1 centimeter and probably 3 millimeters deep) with fairly abrupt walls extended mesially from the porus and included its inner margin, but the outer margin remained unchanged. These findings explain the lack of positive changes in roentgenograms and they also constitute evidence against the theory of origin of the tumor in the internal auditory meatus. When the tumor has extended into the porus, its liberation has not been difficult. Only on one occasion was it necessary to chisel away the outer margin of this opening before this dissection could be completed.

With one exception the operations have been performed under ether anæsthesia. Novocain worked admirably in this exception until the brain stem was reached, when the pain became so severe that ether was given for the capsular dissection. The patients are maintained in the horizontal face-down position. Pulse and blood pressure readings have been the best criteria of the patient's condition and largely determined whether the operation could be concluded in one or two stages.

POSTOPERATIVE COURSE

Few brain tumor extirpations run a more uneventful and satisfactory course than these have done. Without exception, the patients have quickly become conscious, have remained so, and on the following day have appeared free of danger. That two of the series of total enucleations should have survived a superimposed purulent meningitis (streptococcus viridans and staphylococcus aureus), the symptoms of which appeared 48 hours after the operation, indicates the rapidity of recovery from the operation. The postoperative temperature curves of these patients are more

or less uniform. The rectal temperature slowly rises to a maximum which is usually reached in 10 or 12 hours, and it almost as quickly descends to a level around 101 or lower the next morning. Usually the maximum temperature is about 103.6 to 104.2, though one case reached 104.8. At the end of the operation when the patient is coming out of ether, the quality of the pulse will be at its worst and the rate highest. Despite the gradual postoperative rise of temperature, the patient remains conscious and the pulse slowly falls, usually reaching 100 to 120 on the following morning.

Of the series of 5 cases in which the capsule was carefully removed (all in one stage), postoperative dysphagia was present in only one patient, and she had been unable to swallow for 36 hours before the operation. Five days later nasal feedings were discontinued. In all of the four cases in which the capsule was *enucleated with the finger*, nasal tube feeding was necessary, but in two of these patients inability to swallow had developed 7 and 10 days after a subtotal intracapsular enucleation (first stage) and was therefore not caused by the operation. The one death in this series was from pneumonia (eighth day) and was doubtless induced by aspiration during this period when swallowing was difficult. Surely this death could now be avoided. Fluids are now withheld from patients after operation until they are well able to swallow; in the interim the regular nasal feedings are substituted.

Each of the five cases was able to walk out of the hospital with support, and to some extent alone, the time of departure being 16, 18, 18, 25, and 76 days after operation. One patient was unable to walk when she entered the hospital because of a partial hemiplegia (there was also dysphagia) resulting from the tumor's indentation of the brain stem; 22 days after the operation she walked across the room without support. The protracted stay of the patient who remained in the hospital 76 days was due to a postoperative streptococcus viridans infection, which was cured by cisternal drainage. Fortunately this patient has retained no ill consequences of the infection.

SUBSEQUENT COURSE OF PATIENTS AFTER REMOVAL OF TUMOR

There has as yet been no recurrence, but the longest time since operation has been only 3½ years. Every patient is well, free from headache, and has been able to return to work. The one outstanding sacrifice of the operation is the hemifacial paralysis (Fig. 4). It has as yet been impossible to preserve the facial nerve, though I am not so sure that this may not eventually be possible. The reason for this hope is that in one case (previously mentioned) the facial nerve was dissected from the porus to the pons but was finally inadvertently torn when the capsular dissection was continued. The patient is informed of the necessary loss of the facial nerve beforehand and is given the choice of an intracapsular curettement of the tumor. With a spinofacial or hypoglossofacial anastomosis, however, the degree of this deformity has been greatly modified (Figs. 5 and 6). Six of the 8 patients have had spinofacial anastomoses and all with returning function. Before attempting an anastomosis, the function of the spinal accessory or hypoglossal nerves must be tested in order to preclude union with a nerve trunk which may have been injured at the time of operation.

The auditory nerve, being incorporated in the tumor and totally paralyzed before the operation, is irretrievably lost. This, of course, holds equally true when intracapsular enucleation is performed. The trigeminal nerve has been injured at operation in each of the 5 cases, but sensation has returned to a more or less degree in every instance. In the three finger enucleations, the trigeminal function has been destroyed in two and only injured in the third. Ulceration of the insensitive cornea is a danger which must be guarded against by shielding the eye. In one of the eight cases enucleation of the eyeball was finally necessary, and in another vision in the affected eye was lost following healing of the ulcer. The danger of this complicaton is the same as that following resection of the posterior root of this nerve for tic douloureux. With the improved methods of prevention now in vogue, corneal ulceration should become a less disturbing factor.

In every case there has been dizziness and consequently balance of the body has been disturbed, but always there has been a steady and progressive improvement. It is probable that this disturbance may be the result of retracting the cerebellum—a factor which should be lessened as our skill in removing the capsule improves. A very slight weakness and stiffness of the hand on the homolateral side has persisted in 6 cases, and in two recent cases (2 and 6 months) after finger enucleation of the capsule the affection is more pronounced. Soon after the operation there has at times been some slight subjective stiffness of the corresponding leg, but this has soon entirely disappeared except in the above two cases of finger enucleation. Doubtless this slight residual disturbance is the result of injury to the pyramidal tracts in the brain-stem, and for this reason the arm fibers presumably are situated more externally than the fibers for the leg.

Table II indicates in a general way the results obtained in these patients to date. While the time is too short to refer to the absence of recurrence, the encapsulated character of the tumor and its total removal should leave little doubt that they will not recur. It may again be emphasized that the determination of the total removal of the tumor is not by guesswork but by a careful inspection of the site of the growth at the end of the operation. It is at once evident that the results following finger enucleation are incomparable (excepting 1 case) to those following painstaking removal of the capsule.

EXPLANATIONS OF THE MORTALITY FROM VARIOUS PROCEDURES

At first glance it must seem incredible that the total removal of a cerebellopontile tumor can be accomplished with even less mortality than that following the relatively simple curettement of only part of the tumor's interior. It cannot be reasoned that because an operation is simpler, it is better and safer. The simplest operation for these tumors is a cerebellar decompression, but it has been attended by the highest mortality in the hands of nearly every operator. The reason for these seemingly paradoxical results is the simple one of cause and effect. If the patient's condition will justify the additional effort, there is no relief so quick and so complete as that following removal of the cause. There are occasions when the effects of the cause can be relieved by a smaller and less dangerous palliative operation (decompression), but that is only true at times. There are many intracranial tumors which can never be even slightly benefited by any form of palliative procedures, and under such conditions the procedure itself becomes an insult added to an already overstrained intracranial pressure. Cerebellopontile tumors offer seemingly insuperable obstacles to the success of the customary palliative operations in the late stages of the tumor's effects.

The high mortality from the simple enucleation of cerebellopontile tumors with the finger or spatula is now readily understood. Death results from injury to the brain stem when the finger tears the tumor from the brain stem and from packing the denuded brain stem in the frantic efforts to check hæmorrhage. An examination of the brain after death in one of our cases showed the lateral margin of the brain stem softened and minute hæmorrhages extending almost to the midline in the pons and medulla. This finding is not surprising since immediately after the tumor is shelled out there are always symptoms and signs which serve as telltale indicators that the medulla has been injured. At once respirations cease for many seconds (often a minute or more), after which they reappear irregularly and with serious embarrassment, and after several minutes they usually become more or less normal. However, after a severe injury the respirations may remain irregular, difficult, and ineffective, or apparently they may even fail to reappear, though it has never occurred in our cases. But even when the respirations seem to have become satisfactorily re-established, a secondary phase of embarrassment is almost sure to reappear 4 to 8 hours later. It seems probable that this may be a secondary reaction (œdema) of the tissues to the initial trauma. This phase of secondary reaction is characterized by harsh, slightly irregular, and more rapid respirations; the pulse rate accelerates

and diminishes in volume, the temperature rises steadily, the reflexes diminish and the patient becomes progressively more difficult to arouse. Obviously precisely the same effects are produced when the brain-stem is compressed by hæmorrhage.

Why is there such a high mortality following a simple suboccipital decompression in the presence of cerebellopontile tumors? It would often be a great comfort to be able to do a simple bilateral suboccipital decompression and complete the removal of the tumor at a subsequent stage, but for reasons which are only now clear, the mortality is almost as high from this operation alone as from enucleation of the tumor. This danger is shown not only by our own two deaths (100 per cent), but by Tooth's reports which incorporate the results of Horsley's operations. From a series of 7 verified extracerebellar tumors, there were 4 deaths within 15 hours, a fifth died of respiratory distress on the sixteenth day, and the remaining two of meningitis. It is significant that only one of these tumors was actually disclosed at operation, but all were verified by necropsy. There was, therefore, no trauma to the tumor and the contiguous brain stem to account for the high death rate. More recently Trotter (19) has commented upon the dangers as well as the uselessness of suboccipital decompressions for cerebellopontile tumors, a view also voiced by Gordon Holmes. Surely these figures are far too high but the results could never be reduced far enough to make this operation a commendable procedure. In Cushing's series the results following decompression were very much better; there was only 1 death in 10 cases in which a cerebellar decompression was done, but another patient survived only after a desperate struggle in which artificial respiration was maintained for an hour. The reasons for the excessive mortality in decompressing these tumors will be evident if the pathological changes which accompany the tumor's growth are understood, and again those alterations which must suddenly be induced by removal of the occipital bone and dura.

Cerebellopontile tumors not only deeply indent the brain stem (reducing its bulk as much as one-fourth or even more) but dislocate it to the opposite side causing its normal straight mid-axial line to become a pronounced curve. But this great defect and alteration in the brain stem are tolerated because the changes have been so gradual. It is even remarkable that no appreciable disturbance of function can usually be detected by our clinical tests.

Most cerebellopontile tumors are small in comparison with cerebral tumors or even with other tumors in the posterior cranial fossa. Although the posterior compartment is small, the actual bulk of the tumor is not difficult of compensation by (1) partial obliteration of the cisterna magna, the cisterna pontis, the cisterna beneath the mid-brain, and the fourth ventricle; (2) herniation of the tonsils of the cerebellar lobes into the spinal canal (through the foramen magnum); and (3) by pushing the tentorium cerebelli upward (7). Were it not for a new factor which inevitably supervenes as the tumor grows, life could doubtless be maintained for a much longer time by these adjustments.[1] This new factor is closure of the aqueduct of Sylvius. When this small channel becomes closed by the anterior extension of the tumor, hydrocephalus involving the third and both lateral ventricles inevitably results. It is only with the onset of hydrocephalus that the real intracranial pressure develops. The pressure caused by the hydrocephalus always develops rapidly and soon overcomes the space adaptations which had previously been consummated in the posterior cranial fossa; it also quickly reduces to a minimum nature's remaining reserves of space compensation. Though quite firm, tough, and inelastic, the tentorium cerebelli is gradually pushed backward reducing the space in the posterior cranial fossa.[2] These qualities of the membrane, however, must be of great service in temporarily protecting the contents of the posterior cranial fossa, and to the tentorium is doubtless due the preservation of life pending the advent of

[1] The amazing adaptation of the central nervous system to the steady growth of the tumor is also shown in the trigeminal and facial nerves which become flattened, thinned, and elongated to several times their original intracranial span, and usually without any or at most only an insignificant depreciation of function.

[2] The extent to which the tentorium has been stretched can be roughly estimated by the quantity of fluid which can be recovered from a ventricular needle when pressure is gradually applied to the exposed cerebellar hemispheres.

surgery. Without doubt the danger of cerebellar decompression is proportionate to the degree of hydrocephalus which is present at the time of operation.

What happens when the occipital bone is removed and the dura opened widely—cerebellar decompression? Removal of the occipital bone at once liberates the pressure in the posterior cranial fossa. But this benefit is at once countered, and may be greatly exceeded, by the injurious effects of the backward pressure on the tentorium (hydrocephalus) and its full force is now exerted without opposition upon the delicate brain stem jamming it backward. It would seem that this force must be exerted almost entirely through the incisura tentorii for the tentorium itself would hardly be sufficiently elastic to stretch so quickly as to produce these disastrous results.

It must not be inferred that the results following suboccipital decompression are the same for all tumors in the posterior cranial fossa. Variations result from differences in the character, position, and fixation of the tumor. Almost complete relief of all symptoms will at once follow suboccipital decompression when a cerebellar cyst is evacuated. And ofttimes even when a cyst has not been evacuated or an intracerebellar tumor not removed, the same complete but temporary relief will be obtained, for the backward dislocation of the tumor may be great enough to relieve the obstruction at the aqueduct of Sylvius. But cerebellopontile tumors (and some other growths in the posterior fossa) are so firmly fixed to the floor of the skull that dislocation of the tumor cannot occur. Therefore, no relief of the hydrocephalus can be expected from decompression. Moreover, these tumors nearly always extend from one end of the posterior fossa to the other, and are closely attached to the brain stem throughout. Indeed, as noted before, they often extend posteriorly through the foramen magnum into the spinal canal and anteriorly through the incisura tentorii, even at times far enough anteriorly to destroy the posterior clinoid process. Not infrequently, however, a relatively small cerebellopontile tumor produces more severe and fulminating manifestations of intracranial pressure than larger growths because a small projecting nodule of the tumor imbeds itself deeply into the side of the midbrain, causing the aqueduct of Sylvius to be obstructed.

There can be no doubt that many obstructions of the aqueduct and fourth ventricle have a ball-valve action. This can be shown by the fact that at one time the intraventricular pressure will register very high, on a succeeding day it may be normal. In fact, one can easily be misled into assuming the absence of a neoplasm by finding a normal intraventricular pressure; the pressure may be low owing to the particular stage in the cycle of changes resulting from the ball-valve action of the tumor. Such vacillations in pressure are impossible in tumors which have infiltrated the aqueduct; they are most frequent in mobile non-infiltrating tumors; and are of intermediate frequency in fixed non-infiltrating tumors such as the cerebellopontile group. Periodical relief from pressure of this character is doubtless less frequent in occlusions of the aqueduct than of the fourth ventricle because the channel of the iter is so narrow.

It does not seem possible that the hydrocephalus could be relieved by any lateral dislocation of the brain stem away from the tumor in the tentorial opening, for usually the tumor has filled the superfluous space in the incisura tentorii, at least in the lateral aspect; and any anteroposterior dislocation of the brain stem can hardly have any effect other than to make any partial obstruction of the iter complete.

The injury resulting to the brain stem from the supratentorial pressure probably bears a close analogy to that following two other well recognized procedures, often erroneously considered harmless. Severe medullary embarrassment and even death are not rare sequels of a lumbar puncture performed in the presence of high intracranial pressure. Death or other injurious effect in these cases is surely due to the injury inflicted upon the brain stem when by the release of the intracranial pressure the cerebellar tonsils are suddenly driven more deeply through the foramen magnum into the spinal canal. One of the patients in

our series was in coma from this ill-advised procedure.

The other example of the danger of disturbing established pressure relations is shown when lumbar punctures are performed in the presence of certain spinal cord tumors. In a not inconsiderable percentage of cases, sensory and motor function and sphincter control will be quickly affected, even lost, after lumbar puncture (8). In nature's effort again to equalize intraspinal pressure after lumbar puncture in the presence of a complete spinal block, the higher pressure above the tumor can only spend its force by jamming the spinal cord against the immobile tumor. Unless the tumor is situated in the high cervical region, these injuries to the spinal cord affect only function, whereas the analogous (though greater) effects of supratentorial pressure on the medulla in the presence of cerebellopontile tumors compromise life as well as function. We believe, therefore, that when the dural and bony support of the occiput is removed (suboccipital decompression), the supratentorial pressure pushes the brain stem backward through the incisura tentorii until its force is spent; also that this injury to the brain stem is probably augmented by the tug on the firmly fixed cerebellopontile tumor. The degree of this damage is probably proportionate to the grade of intracranial pressure and the size of the tentorial opening (the fixation of the tumor is probably fairly constant).

Why should a suboccipital decompression plus intracapsular removal (subtotal) of a cerebellopontile tumor be less dangerous than a suboccipital decompression alone? The fact that the mortality rate in these tumors has been reduced only by the advent of Cushing's intracapsular method of enucleation is ample evidence for the assertion contained in this interrogation. When the interior of the tumor is sufficiently removed, the capsule will be freed of its rigid support, thereby permitting the obstruction of the aqueduct of Sylvius to be released. The supratentorial pressure (of hydrocephalus), which is the real dangerous factor in these operations, will be automatically relieved as effectually for the time being as if the tumor were removed. But one of the greatest defects of subtotal intracapsular enucleation is the difficulty of removing the proper amount of the contents of the tumor to permit this benefit to accrue. Unless the tumor is thoroughly removed so as to leave a fairly empty capsule, the remaining tumor will be essentially as rigid and immobile as the original tumor, and there would then be little if any relief either to the laterally deflected brain stem or to the hydrocephalus. During the removal of the contents of the tumor with a curette, only the outer surface of the growth is brought into view and one has great difficulty in knowing, indeed it is usually impossible to determine, the depth of tumor which still remains imbedded in or projecting beneath the brain stem. The importance of this determination we have learned from completely shelling out the interior of the tumors, as our deliberate total extirpations now necessitate. Curetting the interior of the tumor with the brain stem in the background, necessarily demands caution and, in playing safe, usually more tumor remains than seems possible from the apparent size of the exposed stump. In one of our two-stage extirpations 18 grams of tumor was curetted away and we thought but little was left with the capsule. The remainder of the tumor, when removed at the second stage, weighed 26 grams!

Since hydrocephalus results from occlusion of the iter, and since hydrocephalus is one of the chief factors in the operative mortality, it is safe to infer that the part of the tumor demanding urgent excavation is the upper pole. Otherwise, the hydrocephalus cannot be relieved. One of Cushing's necropsy specimens (Case xix) shows the upper pole of the tumor practically untouched by the intracapsular removal.

The configuration of the tumor also has something to do with the amount of tumor *in situ* after a subtotal removal. Nodules may project into the brain-stem from the inner side of the tumor. It has seemed that these deeply imbedded and invisible localized masses at times cause more symptoms referable to the brain stem and play a greater rôle in obstructing the aqueduct of Sylvius, than the big bulk of the tumor. The effect of the nodules will not be greatly, if at all, influenced by removal of the outer portion of the tumor with a curette.

Unless one is acquainted with the technical steps in a bilateral cerebellar operation, it would be reasonable to question why the brain stem has not already been injured by the supratentorial pressure during the operation, when the dura is opened widely. This pressure, however, is always under control. Puncture of a posterior horn of a lateral ventricle is always utilized to reduce the supratentorial pressure to that of the atmosphere. The period of great danger to the patient when the hydrocephalus has not been relieved, is in the few hours succeeding the operation—when the intraventricular pressure is again re-established.

Why should there be less mortality after subtotal intracapsular enucleation of the tumor plus removal of the remainder of the tumor, than from the partial removal alone? From this series two deaths were surely impending about 2 weeks after partial intracapsular enucleation of the tumors and were finally prevented by removal of the remainder of the tumor at that critical period. The defects of the partial operation, therefore, really forced the total removal of the growth. In every case in which a subtotal intracapsular operation has been performed (6 in all, if those cases are included in which the intracapsular method was the first stage), the immediate postoperative course has been perfectly satisfactory. It has been several days later when the patient should have been out of danger that the alarming symptoms developed. In some way the stump of tumor caused the important functions located in the brain stem to be seriously compromised. We know from the gross appearance at the second operation that the stump of tumor which remained was swollen and friable—doubtless owing to nature's method of repair—but in all probability these same changes were also present in the contiguous brain tissue and were responsible for the symptoms. Whatever the exact explanation may be, complete subsidence of all symptoms at once followed extirpation of the residual tumor and capsule. No such complication has appeared in any of the cases (5) in which the entire tumor has been removed at one sitting.

A careful survey of the results after various operative attacks, brings us to one general conclusion: with proper care and attention to detail, that operation which at once removes the cause (other things being equal) not only carries the lowest mortality but at the same time offers incomparably the best immediate and permanent results.

TABLE I.—KIND OF OPERATIONS AND RESULTS

Kind of Operation	Number of Cases	Recovery	Death	Cause of Death
No operation	1	0	1	Died at stool before time set for operation.
Patients in coma at time of operation (intracapsular enucleation and dissection of capsule)	2	0	2	Operation.
Suboccipital decompression. (Tumor not removed)	2	0	2	Operation.
Tumor shelled out with finger (interior not removed)	6	2	4	
Intracapsular enucleation	3	1	2	Both died of meningitis, one on the 46th, the other on the 4th day.
Intracapsular enucleation followed by finger enucleation of the tumor: 3 cases in 2 stages, and the fourth in one stage	4	3	1	Pneumonia, 8th day.
Intracapsular enucleation followed by deliberate, painstaking dissection of the capsule (all concluded in one stage)	5	5	0	

OPERATIONS ON PATIENTS IN COMA FROM THE EFFECTS OF CEREBELLOPONTILE TUMORS

There is one exception to the above generalization concerning the removal of the tumor, viz., patients in coma from this type of tumor.

I have excluded from the operative mortality of total extirpations, two patients who entered the hospital when totally unconscious and who were operated upon while in this state. One patient had been unconscious 8 hours, the other 3, when the operation began, and in each there was Cheyne-Stokes type of breathing. Furthermore, in the first instance the location of the growth was entirely unknown until determined by ventricular estimation. The treatment, if any, for such cases is, I believe, distinctly a different problem from that which obtains when patients are in coma from tumors situated elsewhere in the cranial chamber. When patients are comatose from

TABLE II.—END-RESULTS.

CASES WITH RECOVERY AFTER CAREFUL REMOVAL OF CAPSULE

	Age	Time Since Operation	Gait	Balance	Arm and leg on affected side	Romberg	Ataxia	VN.	Headaches	Wt.	Remarks
MRW I	40	1 yr.	Walks 1½ miles per day Feels safer with support	Still feels dizzy but is improving	Leg well. Arm and hand stiff	Slight	Neg.	Sensation felt but less acutely	None	+10	Postoperative meningitis (streptococcus viridans) Cisternal drainage.
TH II	56	1 yr.	Walks well	Slightly dizzy	Stiffness hand. Leg normal	Slight	Neg.	Not normal but present	None	−10	
EB III	44	1 yr.	Can walk 4 miles without support. Feels need of assistance only on rough ground and down steep grades	Still slightly affected but gradually disappearing	Hand still slightly affected	Neg.	Neg.	Patch of anæsthesia below eye	None	+8 to +15	Healed corneal ulcer. Little vision remains.
JM IV	29	2½ yrs.	Except narrow plank or down steep grade, can walk anywhere without support	Practically normal	Still slight weakness of arm; leg normal	Slight	+	Some loss but sensation present	None	−25	Was unable to walk before operation. Hemiplegia and difficulty swallowing.
IR V	36	1½ yrs.	Can walk a mile without support	Still feels slightly uncertain	Very slightly less than normal	Neg.	Neg.	Not quite normal	None	Same	

CASES WITH RECOVERY AFTER INTRACAPSULAR ENUCLEATION FOLLOWED BY FINGER EXTIRPATION OF CAPSULE

EL VI	25	3¾ yrs.	Can walk any distance alone	Only occasional loss of balance	None	Very slight swaying	Neg.	Normal about lower face; diminished above	None	+15	Two-stage operation.
RLB VII	48	6 mos.	With support can walk briskly, but requires help except in house	Very marked difficulty in balancing	Good grip but quite shaky	Markedly positive	+	Sensation absent	None	+40	Ulcerated eye removed. Hearing much better. Smallest tumor of series but symptoms of 20 years.
WD VIII	23	2 mos.	On discharge from hospital can walk with support. Pt. has been 2 months recuperating from meningitis and a resultant hydrocephalus	Very marked difficulty in balancing	Markedly affected	Markedly positive	+	Sensation absent	None	−10	Postoperative meningitis (staphylococcus aureus); cisternal drainage; resulting hydrocephalus cured spontaneously. Largest tumor of series, wt. 46 gms. Two-stage operation.

NOTE.—As all of the patients live at a distance, this table is compiled from answers to letters of inquiry. Six of the eight cases have had spinofacial anastomoses with returning function in each instance.

intracranial pressure, it is often possible to restore consciousness by a palliative, properly placed decompression; and at times the tumor may even be safely removed while the patient is still unconscious, all of course depending on the depth and duration of coma and the location and character of the tumor. In many such cases it is incumbent and preferable only to relieve the intracranial pressure immediately and the removal of the tumor can await a second stage, if advisable.

But, as said before, coma from cerebellopontile tumors is not amenable to relief from any form of decompression. Even when the patient is quite conscious and in good condition, a suboccipital decompression is tantamount to a mortality in the advanced stages of intracranial pressure. The realization of the fulility of operative palliation in these tumors urged the more radical attempt at removal of the tumor after first curetting the interior. Despite the fact that the extirpation

was easy and bloodless in both instances, consciousness was not restored, there was no relief, and death followed within a few hours. In such cases we are dealing with a brain stem already severely injured before the operation began and any operation entailing even the slightest additional injury (such as the removal of the tumor must necessarily exact), could not be tolerated, even with relief of the supratentorial pressure.

Whether the partial intracapsular procedure would ever be successful under such conditions, one can only conjecture. Realizing as we do now the underlying differences between the coma of these and other tumors, it would surely have been wiser to have desisted, though the results would hardly have been different. This particular phase of the problem seems very dismal from our present knowledge and experience. I fear some new and totally different line of attack must be evolved if any results are to be expected in such cases. One great difficulty in these comatose patients is the differentiation beforehand of the kind of tumor, though its location in the posterior fossa may be clear. For tumors other than the cerebellopontile variety (such as intracerebellar tumors), a cerebellar decompression would always be indicated and would frequently prove effective treatment. When the character of the tumor has been determined only by operation, one is faced with the problem of proceeding with operative treatment. And when patients in coma from the effects of cerebellopontile tumors have been subjected to operation, decompression alone will surely be fatal; one can hardly do less than perform the operation devised by Cushing, and surely not more.

SUMMARY

An operative procedure is presented by which cerebellopontile (acoustic) tumors can be completely removed. After a thorough and carefully guarded intracapsular enucleation, the capsule of the tumor is painstakingly dissected from the brain stem.

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END-RESULTS IN ONE HUNDRED CASES OF ANTERIOR POLIOMYELITIS OPERATED ON AT FORDHAM HOSPITAL

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SINCE the epidemic of 1916, our knowledge of anterior poliomyelitis has increased a great deal. Although we have not as yet found the definite and specific cure, we can claim that by following proper orthopedic treatment, many of the sequelæ can be abated. Many patients can not only be relieved of their deformities but even be made to walk and work without being handicapped to any great extent. Varied operations have been invented. Many have already fallen into disuse. Almost every orthopedic surgeon develops a favorite operation and follows his cases carefully; others, however, attempt every new operation and so have no chance to compare the results.

In their report the Committee of the American Orthopedic Association which was appointed to standardize stabilization operations of the ankle, showed the value of certain operations and the uselessness of others. Operations on other joints have not been investigated as yet. Final results of operations performed in hospitals of high standard as a rule are published from time to time. Such reports are, of course, extremely helpful to those interested, and it should be the duty of every surgeon to go over his final results from time to time and publish them. A frank review will be of great service to him as well as to the readers.

After reviewing my first hundred operations on patients suffering with anterior poliomyelitis performed at Fordham Hospital since January, 1917, I thought it advisable to publish my findings. The year 1917 was chosen by me as a starting point because at that time, following the epidemic of 1916, the after-care had been better carried out, and the results could be judged more correctly. In addition, many cases from previous epidemics were submitted at that time for operation. Thus the results on new as well as old cases could be properly tabulated.

GENERAL OUTLINE OF THE WORK

All the patients included in this report were treated by me at the orthopedic clinic of the Fordham Hospital out-patient department before admission to the hospital.[1] In the recent cases the ordinary treatment such as massage, muscle training, and braces was given for some time before the patients were submitted to operation. In the old cases, very often for a short time only treatment was given to develop certain muscles or accustom the patient to the clinic routine until a hospital bed was available. In other cases marked deformities had to be corrected at once before treatment was instituted.

Most of the patients therefore were observed by me before operation and a proper diagnosis was made. Every operation herein reported I performed personally, and thus eliminated one factor which might lead to a difference in results. Having performed the operations myself, I feel that I am in a better position to watch the results.

After their discharge from the hospital, patients were treated at the out-patient department under my care and were examined by me from time to time. If necessary the patient was readmitted for reoperation or for another operation. Within the last few weeks the majority of the cases have been re-examined by me so that the final results are more nearly correctly stated.

I have not tabulated the reasons for the choice of operation in each case; it is implied that in each case the operation chosen was in my opinion the type of operation indicated. If the result was not what could have been expected and if the technique or after-care was not at fault, I consider that the operation performed did not meet the requirements (Table I).

[1] For the benefit of surgeons outside of New York City I will state that Fordham Hospital is a general hospital, a branch of Bellevue and Allied Hospitals.

TABLE I.—CASES OF ANTERIOR POLIOMYELITIS TREATED AT FORDHAM HOSPITAL

No.	Patient	Kind of operation	General impression of result	Remarks
1	A. D.	Astragalectomy	Good	
2	R. G.	Tenodesis of posterior tibial. Transplantation of extensor proprius hallucis. Tendon lengthening of tendo achillis	Failure	
3	R. B.	Stretched tendo achillis	Good	Lost track of patient.
4	N. M.	Astragalectomy	Good	
5	H. V.	Astragalectomy of left leg	Good	Re-operation necessary. Davis' operation performed. Failure due to neglected after-treatments.
6	B. S.	Astragalectomy	Good	
7	C. G.	Subcutaneous tenotomy		Lost track of patient before plaster was removed.
8	H. E.	Stretching of tendo achillis	Good	Lost track of patient.
9	B. P.	Stretching of tendo achillis	Good	
10	A. D.	Arthrodesis of left knee.	Good	
11	E. B.	Stretched tendo achillis	Good	
12	M. C.	Brisement forcé of hip, knee, and ankle	Good	
13	M. P.	Stretched tendo achillis	Good	
14	F. R.	Arthrodesis of shoulder and transplantation of trapezius	Poor	
15	R. P.	Stretched tendo achillis and tensor fasciæ femoris	Poor	
16	A. V.	Astragalectomy and tenodesis of peronei	Fair	
17	H. H.	Transplantation of biceps for quadriceps	Good	
18	S. B.	Stretched tendo achillis		Lost track of patient.
19	H. V.	Subcutaneous osteotomy of left femur	Good	
20	D. M.	Tenotomy of tendoachillis and correction of flat foot	Good	
21	R. G.	Astragalectomy and transplantation of peronei	Good	
22	H. V.	Astragalectomy of foot	Poor	Had to be operated upon again, extreme muscular atrophy.
23	J. M.	Astragalectomy	Good	Extreme atrophy of leg developed.
24	A. H.	Subcutaneous tenotomy of tendo achillis	Good	
25	E. D.	Stretched tendo achillis. Cut hip flexors	Good	
26	M. K.	Stretched extensor tendons of hand	Good	
27	D. Z.	Fasciotomy of plantar fascia and brisement forcé	Good	
28	M. C.	Subcutaneous tenotomy of hip flexors	Good	
29	R. S.	Subcutaneous tenotomy of hip flexors and tendo achillis	Good	
30	A. H.	Osteotomy of right femur	Good	
31	A. H.	Osteotomy of left femur	Good	
32	R. P.	Tenotomy of hip flexors	Good	Soutter's operation done later.
33	R. G.	Stretched tendo achillis	Poor	Reoperated upon later. Astragalectomy performed.
34	M. P.	Tenotomy of tendoachillis and hip flexors. Right side	Good	
35	M. P.	Tenotomy of tendoachillis and hip flexors. Left side	Good	
36	J. T.	Subcutaneous tenotomy of tendo achillis	Good	
37	H. W.	Transplantation of peronei to scaphoid	Good	
38	M. S.	Corrected loose joint after previous astragalectomy. Davis arthrodesis	Good	
39	M. K.	Brisement forcè of extensor tendons of hand		Lost track of patient.
40	T. K.	Astragalectomy and tendon fixation	Good	
41	D. G.	Soutter's on left side	Good	Man of 21 had anterior poliomyelitis at age of 2. Severe contraction of hip. Very good result.
42	G. R.	Tenotomy of plantar fascia and tendo achillis. Extensor of little toe cut	Fair	
43	J. C.	Subcutaneous tenotomy of plantar fascia and tendo achillis	Good	
44	H. T.	Cut plantar fascia. Stretched foot for talipes calcaneovarus	Good	
45	H. V.	Transplantation of biceps for quadriceps, left	Good	
46	F. E.	Astragalectomy	Good	
47	J. J.	Astragalectomy of right foot	Good	
48	E. K.	Astragalectomy—right	Poor	Case 82 reoperated upon on account of failure to displace foot backward at first operation.
49	R. P.	Soutter's—right	Good	

TABLE I.—Continued

No.	Patient	Kind of operation	General impression of result	Remarks
50	R. P.	Soutter's—left	Good.	
51	H. D.	Open tenotomy of tendo achillis. Jones' transplantation of extensor longus hallucis	Good	
52	J. J.	Soutter's on right side	Good	
53	D. G.	Soutter's on right. Dislocation corrected	Excellent	Same patient as Case 41. An old standing anterior poliomyelitis. Double Soutter's. Excellent result.
54	M. L.	Astragalectomy of left foot	Good	
55	M. C.	Cuneiform osteotomy of right femur	Good	
56	J. J.	Left astragalectomy	Good	
57	A. H.	Astragalectomy	Good	
58	R. C.	Astragalectomy and tendon fixation	Good	
59	M. C.	Soutter's left hip	Good	
60	R. G.	Astragalectomy	Good	
61	M. L.	Subcutaneous osteotomy of femur	Good	
62	P. A.	Steindler's		Lost track of patient.
63	A. D.	Jones' operation for extensor longus hallucis transplantation	Good	
64	M. L.	Manipulation for malunion of the osteotomy of Case 61	Good	
65	M. C.	Right astragalectomy	Good	
66	E. K.	Left astragalectomy	Good	
67	J. B.	Left astragalectomy	Good	
68	S. G.	Astragalectomy	Good	
69	R. C.	Soutter's right	Good	
70	M. L.	Whitman's loop, right	Poor	Died by accident but the result of operation was poor.
71	G. B.	Astragalectomy	Good	
72	R. G.	Arthrodesis of shoulder	Failure	
73	P. P.	Whitman's loop, right	Good	
74	M. F.	Astragalectomy	Good	
75	F. M.	Steindler's	Good	
76	J. S.	Left astragalectomy	Good	
77	H. G.	Steindler's and Jones', left	Good	
78	E. K.	Transplantation of left biceps	Good	
79	S. M.	Tenotomy of tendo achillis and transplantation of peronei into scaphoid	Good	
80	A. P.	Astragalectomy	Good	
81	L. S.	Right astragalectomy	Good	
82	E. K.	Replacement of foot backward from previous astragalectomy. Davis operation	Good	
83	E. P.	Right astragalectomy	Good	
84	M. C.	Transplantation of right biceps for quadriceps	Good	
85	H. V.	Davis' for right due to bad result of astragalectomy	Good	Heel down on the floor.
86	C. C.	Astragalectomy	Good	
87	J. B.	Transplantation of biceps for quadriceps	Good	
88	F. W.	Steindler's and Jones'	Good	
89	B. W.	Astragalectomy	Good	
90	M. C.	Biceps into quadriceps, left	Good	
91	I. Z.	Steindler's and Jones'	Good	
92	I. Z.	Removal of exostosis of bunion	Good	
93	G. M.	Open tenotomy of tendo achillis. Stretching of plantar fascia	Good	
94	A. Y.	Right astragalectomy	Good	
95	S. J.	Subcutaneous tenotomy of left foot	Fair	
96	R. S.	Left astragalectomy	Good	
97	J. W.	Right astragalectomy	Good	See footnote [1].
98	A. M.	Left astragalectomy	Good	
99	F. A.	Right astragalectomy	Excellent	
100	M. K.	Left open lengthening of tendo achillis	Excellent	

[1] J. W. was a man of 27 who had infantile paralysis at the age of 1 year and nothing was done for him. There was marked atrophy of the entire limb. After the astragalectomy, muscular power increased tremendously in the entire lower extremity even in the quadriceps.

THE AFTER-TREATMENT

The after-treatment consisted usually of the application of plaster casts and braces, massage, and muscle training. However, the poor results could not always be attributed to poor technique or unfortunate choice of method of operation, as many of these patients did not follow the directions faithfully. Anyone who is acquainted with an out-patient department knows how hard it is to carry out any preconceived plan. Still we can learn a great deal from such deficiency. An operation that has

TABLE II.—END-RESULTS IN 100 OPERATIONS FOR ANTERIOR POLIOMYELITIS

Operation		No. times performed	Functional result				Anatomical result				Final results as compared with expected results in terms of percentage						Remarks
			Ex.	Good	Fair	Poor	Ex.	Good	Fair	Poor	50	60	70	80	90	100	
OPERATIONS IN THE REGION OF THE FOOT																	
Astragalectomy	Cases	34	19	13	0	1	12	15	4	2	1	2	5	8	10	7	
	Per cent		56	38		3	35	44	12	6	3	6	15	24	29	21	
Davis' posterior displacement of the ankle joint	Cases	3		3					3					3			
	Per cent																
Stretching of the tendo achillis	Cases	9	2	5									2	2	2	1	Immediate result good. Lost track of 2 patients. A second operation in 1 case.
	Per cent		22	56									22	22	22	11	
Subcutaneous tenotomy of tendo achillis	Cases	5		2	1			1						1			Immediate result good. Lost track of 2. Second operation in 1 case.
	Per cent			40	20			20						20			
Open tenotomy of tendo achillis	Cases	1	1				1									1	
	Per cent																
Fasciotomy of plantar fascia and brisement forcé	Cases	2		2				2							2		
	Per cent																
Stretched tendo achillis and tenotomized hip flexors	Cases	1		1													Immediate result good. Patient later died of some intercurrent disease.
	Per cent																
Subcutaneous tenotomy of hip flexors and tendo achillis	Cases	3	1	2			1	2					1	1		1	
	Per cent		33	67			33	67					33	33		33	
Subcutaneous tenotomy of plantar fascia, tendo achillis, and extensor of little toe	Cases	1															Immediate result good. Lost track of patient.
	Per cent																
Steindler's operation for pes cavus	Cases	2			1				1					1			Immediate result fair in 1. Lost track of other patient.
	Per cent				50				50					50			
Open tenotomy of tendo achillis and Jones' transplantation of extensor longus hallucis	Cases	1	1				1								1		
	Per cent																
Open tenotomy of tendo achillis and stretching of plantar fascia	Cases	1	1				1									1	
	Per cent																
Tenodesis of anterior and posterior tibial muscle; transplantation of extensor proprius hallucis; tendon lengthening of tendo achillis	Cases	1															Complete failure. Had to be re-operated on later.
	Per cent																

TABLE II.—Continued

Operation		No. times performed	Functional result				Anatomical result				Final results as compared with expected results in terms of percentage						Remarks
			Ex.	Good	Fair	Poor	Ex.	Good	Fair	Poor	50	60	70	80	90	100	
OPERATIONS IN THE REGION OF THE FOOT—Continued																	
Subcutaneous tenotomy of plantar fascia and tendo achillis	Cases	1	1					1								1	
	Per cent																
Jones' operation for transplantation of extensor longus hallucis	Cases	1		1				1						1			
	Per cent																
Whitman's loop operation	Cases	2		1				1						1			"In second case" Immediate result, fair. Patient died later of some intercurrent disease.
	Per cent			50				50						50			
Steindler's and Jones'	Cases	3	1	1	1		1	1	1			1		1		1	
	Per cent		33	33	33		33	33	33			33		33		33	
Open tenotomy of tendo achillis and transplantation of peronei	Cases	2		2				2						1	1		
	Per cent													50	50		
Hallux valgus operation	Cases	1		1				1						1			
	Per cent																
Transplantation of peronei into scaphoid bone	Cases	1			1				1			1					
	Per cent																
OPERATIONS ABOUT THE KNEE																	
Transplantation of biceps for quadriceps	Cases	6	2	3	1		1	5						2	3	1	This operation gives very satisfactory results.
	Per cent		33	50	17		17	83						33	50	17	
Arthrodesis of knee	Cases	1	1					1								1	
	Per cent																
Subcutaneous osteotomy of femur	Cases	4	3	1			3		1					1		3	
	Per cent		75	25			75		25					25		75	
Cuneiform osteotomy of femur	Cases	1		1					1					1			
	Per cent																
OPERATIONS ON THIGH AND HIPS																	
Soutter's operation	Cases	7	6	1			4	3						3		4	A very useful and satisfactory operation for even long standing cases.
	Per cent		86	14			57	43						43		57	
Subcutaneous tenotomy of hip flexors	Cases	2															A valueless operation. The immediate result was good. As condition recurred, required a Soutter's.
	Per cent																

TABLE II.—Continued

Operation		No. times performed	Functional result				Anatomical result				Final results as compared with expected results in terms of percentage						Remarks
			Ex.	Good	Fair	Poor	Ex.	Good	Fair	Poor	50	60	70	80	90	100	
OPERATIONS ON THE SHOULDER																	
Arthrodesis of shoulder and transplantation of trapezius	Cases	1															Immediate result fair. Lost track of patient.
	Per cent																
Arthrodesis of shoulder without transplantation of trapezius	Cases	1			1			1									
	Per cent												40				
Stretched extensors of hand	Cases	2															Immediate result fair. Lost track of patient.
	Per cent																

proved a success in a clinic case would give, of course, better results in a private case.

SYSTEM OF TABULATION OF END-RESULTS

Instead of tabulating the results as excellent, fair, and poor, I have considered them under four separate headings, viz., (1) functional, (2) anatomical or æsthetic result, (3) final result as compared with the expected result, and (4) duration of time under treatment. We then subdivided the first three into excellent, good, fair, and poor.

1. *Function.* As most of the patients were children, it was not necessary to assume different standards as is the usual custom with adults; i.e., what may be considered a good functioning foot for a worker is not a good one for a dancer, etc. We considered that the aim of each operation was to enable the patient to walk without a brace with as little limp and discomfort as possible. I regard as the most important factor the functional result. When function has been greatly improved I feel that the operation has been a success.

2. *Anatomical or æsthetic result.* It is generally acknowledged that many patients (and this is especially true of women) are as sensitive about the appearance of an afflicted limb as they are of its improper functioning. It is, therefore, of medical interest to see whether certain operations improve the æsthetic effect.

3. *End-result.* We are often disappointed because the results of an operation do not come up to our expectations. The patient or the parents are often also disappointed because they have expected too much from the operation. Of course, there are occasions when the surgeon is dissatisfied but the patient is extremely pleased as he has a good functioning limb. In his review on end-results Brown mentions the fact that in many cases he considered the result poor while the patient was well satisfied. It was therefore worth while to get information from the patient as to his opinion of the expectation and result. Many of the answers were interesting.

4. *Duration of time under treatment after operation.* This could not be ascertained in every case as clinic patients do not come regularly. Some nervous parents brought the children too often and for a rather longer period than was really necessary. Hence a justifiable conclusion can not be drawn from this class of cases.

TYPES OF OPERATIONS

The first column in Table II shows the various types of operations. Some of the operations performed are perhaps now obsolete but at that time these operations were in vogue.

Many steps in the operations have been changed from time to time, for instance, in the astragalectomies. At the beginning I cut and transplanted the peroneal tendons, then only cut them and sutured; and now I do not disturb them. The reason for these changes in astragalectomy, for instance, is that I have frequently visited the clinic of R. Whitman

and having followed his technique closely, have modified the steps of the operation as he changed them. The same holds true of other operations in this series in which the originator in later articles modified the steps of the operation. While many steps of certain operations have been discarded because they were found harmful, others have been given up as useless.

The technique I use is the technique employed by the majority of orthopedic surgeons and has been varied according to the advancement made by various observers.

CONCLUSIONS

1. Many complicated operations for cases of anterior poliomyelitis can be performed in a general hospital as well as in a special orthopedic hospital.

2. It is absolutely obligatory that the orthopedic surgeon who operates on a child for deformity following anterior poliomyelitis carry out and personally supervise the after-treatments, as many valuable operations are discredited because the after-care is not properly carried out.

3. For stabilization of the foot, astragalectomy is the best operation as to result in both function and shape.

4. After an astragalectomy the muscles throughout the entire lower extremity, even the thigh muscles, improve immensely.

5. Open instead of closed (subcutaneous) tenotomy should be performed.

6. Transplantation of biceps for quadriceps gives very satisfactory results.

7. Soutter's operation for transplantation of hip flexors is a very useful and satisfactory operation for cases of even long duration.

8. Steindler's operation of transplantation of plantar muscles gives good results, but one must be sure to stretch the foot considerably and use a brace for a long time.

9. Gallie's operation of tendon fixation has not given me desired results.

10. Jones' operation of transplantation of the longus hallucis gives good results.

11. Tendon transplantation fails if a weak muscle is expected to do the work of a strong muscle.

I wish to thank the visiting surgeons of Fordham Hospital for the free hand given to me. I also desire to express my gratitude to the nurses of the Association for the Aid of Crippled Children, especially to the director, Miss Wilson. They have followed many of the cases and have traced the results for us.

I also want to take this opportunity to thank Royal Whitman in whose clinic at the Ruptured and Crippled Hospital I have watched many of these operations and have benefited greatly by his skill and teaching.

ŒDEMA AND HYPERTROPHY OF THE CERVIX UTERI DURING THE PUERPERIUM

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THE obstetrical complication which is the subject of this article is uncommon. In the medical literature of the last 20 years are found but few reports of the condition, and I have seen only two cases since 1896. I wish to make it plain that I refer only to those cases of total enlargement of the cervix uteri, and I say enlargement in order not to prejudge the nature of the anatomical lesions that have been observed.

Partial œdema of the cervix is very common, is localized in the anterior lip, and usually is associated with prolonged labor, particularly with an occipitoposterior presentation. Complete œdema with neither enlargement or elongation of the cervix is the initial sign of the condition poorly named anatomical rigidity, probably contracted cervix in English. But in the one condition the cervix has a characteristic appearance quite distinct from that seen in the other condition.

If the many unsolved problems that confront us in the pathogenesis of supravaginal hypertrophies other than pregnancy are borne in mind, no one will criticize us so long as the clinical picture is complete, if many things are left unexplained.

Case 1. My first outstanding case was observed early in 1897. One afternoon I was called by Madam Fazio, a midwife, to assist a multipara who, according to her report had a uterine prolapse. I found a woman of 30 or 35 years, quite exhausted, who had been in labor since morning, with intense labor pains. During pains the cervix, turgid, violaceous, and dilated 3 to 4 centimeters, with a fetal foot presenting, began to appear and protrude from the vulva. At the height of labor pains, the cervix protruded from 7 to 8 centimeters from the vulvar ring.

A cursory examination showed that at the time of greatest prolapse or protrusion, the vaginal canal retained practically its normal depth. In the vagina was felt a thick cylinder with smooth walls throughout, of the same consistency as the protruding cervix. The cervix was easily dilated and by slight traction I extracted one of dead twins that appeared to be a 5 to 6 months' fetus. Promptly a foot of the other fetus presented and this fetus was also easily extracted. The placenta was delivered by simple expression without mishap. Immediately after delivery the contracted fundus of the uterus could be felt about 12 centimeters above the symphysis pubis, notwithstanding the fact that the cervix protruded an equal distance from the vulva. The puerperium was normal and 1 month afterward I verified the diagnosis of supravaginal and infravaginal hypertrophy of the cervix without uterine prolapse or colpocele. The patient did not wish to be operated upon.

Case 2. On September 21, 1916, there came to my service a woman, E. F. de M., Uruguayan, 36 years of age, married, without any previous illnesses except measles and scarlatina in infancy. Menstruation since the age of 15 had always been regular and abundant; neither sexual relations nor childbirth had modified its character. The general physical examination revealed no organic alterations; the Wassermann reaction was negative. Patient said she had had 4 pregnancies, 3 normal to term, and was now in the course of the fourth, having had her last period in January, 1916. The puerperium had always been normal although for a few days after her last labor in 1913 she felt that her uterus appeared at the vulva, but was easily reduced, after a physician had indicated the *modus faciendi*. As she felt better, she was not examined again although during this pregnancy she felt a continual sense of heaviness in the perineum. On September 19 she suddenly felt a foreign body protruding from the vulva. She believed it to be the fetus and called to a neighbor. Dr. C. was consulted and he advised her removal to a hospital. It was not possible to find data regarding the initial dimensions of the tumor, but she was examined by me on her arrival in the hospital. She appeared to be in excellent general health. Locally, examination disclosed a voluminous tumor that emerged from the vulva in the form of a truncated cone, the lesser base of which was continuous but without a definite line of demarcation from the thick cylindrical portion—the supravaginal part of the cervix. The mass was resistant, about 10 centimeters in diameter in its most external portion, 5 centimeters at the level of the vulva, and 11 centimeters from this to the border of the greater base, which presented a transverse fissure of 5 centimeters. The commissures were continuous with the remains of the old tears. The mass also presented a series of transverse folds continuous with the anterior column of the vagina. The discoloration was variable—lilac in the portion adjacent to the vulva, violet in the part more distant, mottled with gray and red spots and covered with islands of false membrane. On the posterior lip,

there was an ecchymotic area triangular in form measuring 2 by 1.5 centimeters. The lateral and posterior vaginal space was retained, but not the anterior which was completely precluded by the tumor. The tumor was irreducible. On deep palpation the unengaged fetal head could be felt. The body of the uterus had the normal characteristics of a pregnancy 7½ to 8 months.

As there was no indication for urgent measures, I chose expectant treatment, and after a thorough cleansing applied a pack saturated in Dakin solution, changing it frequently. The pulse was 76, the temperature 36.8 degrees C.

September 22. The night passed quietly and the patient stated that she was greatly relieved; the temperature was 36.6 degrees C.; pulse, 80. Notwithstanding this the local condition became aggravated, the under surface of the tumor was of a grayish green color and the general surface covered with numerous vesicles filled with seropurulent fluid alternating with areas of false membrane.

The rapid progress of cervical destruction induced me to intervene immediately. Operation was performed by Dr. Turenne, assisted by Dr. Cortabarria and the anæsthetist, Bereetche. Ether anæsthesia was used. The patient was placed in the obstetrical position and the denuded surface of the tumor covered with a field protection. A vaginal circular incision was made flush with the vulva at the level of the lower margin of the bladder. Separation of the vagina from the bladder was simple because of the considerable œdema of the submucous tissues. The supravaginal portion of the tumor was removed 3 centimeters above the incision in the mucosa. The vaginal and cervical mucosæ were united by circular suture and a vaginal tampon of iodoform gauze was inserted. A centigram of morphine was given and repeated every 6 hours.

In the afternoon the temperature was 36.8 degrees C; pulse 92. September 23 at 4:30 a.m. the patient advised the interne, Dr. Garcia San Martin, that for the past half hour she had felt labor pains in spite of the administration of 1 centigram of morphine. Immediately following this the tampon was expelled and then the fetal head covered with the membranes appeared. The membranes were ruptured and the slow spontaneous delivery of a living female child weighing 2,400 grams followed. The parietal measurements were 8.2 centimeters and the occipitofrontal circumference 2 centimeters. Examination showed the cervicovaginal sutures intact. There was no hæmorrhage. Another iodoform tampon was placed and removed 6 hours later. The temperature throughout the day was 36.6 to 36.8 degrees C. and the pulse 100 to 108. The vagina was irrigated with Dakin solution.

September 24. On examination the cervix appeared in good condition. A fetid clot which had been left was removed, a tube inserted, and Dakin solution applied by Carrel method. The temperature was 37.5–38.3 degrees C. and pulse 100–110. On September 25 the temperature was 39–38.6 degrees C.; pulse 115–104. On September 26 the temperature was 37.5–39; pulse 96–62. On September 27, the temperature was 38.4–38.2 degrees C.; the pulse 96–92, and lochia was diminished and less fetid. On September 28, the temperature was 38–40; the pulse 88–124. The first chill occurred during the night. On September 29 the same treatment was followed locally. It was thought that this might cause localization of the abscess. The temperature was 37.6–39.5; pulse 108–100. On September 30 the abscess had become frankly localized. The temperature was 38.4–40; pulse 104–120.

After this day the course showed a pyæmic trend. On October 2, in spite of the good reaction to the localized abscess, purulent collections appeared in the metacarpophalangeal joints of the left hand. On October 14 phlebitis of the left leg developed but the blood culture was negative. On October 18 the veins of the right leg were involved and the œdema reached the region of the umbilicus. On November 10 the blood culture showed abundant chains of streptococci; the œdema invaded other regions, continually extending to higher levels; there was evidence of abundant collateral circulation over the anterior portion of the thorax; and also transient œdema of the face and upper extremities. Rapidly there developed an obstinate diarrhœa, delirium, a return of the chills, and hyperpyrexia. The patient died on the night of December 6.

At autopsy were found no peritoneal, adnexal, or uterine lesions. There was an enormous vascularization and venous stasis with abundant exudate in the pleural, peritoneal, and pericardial cavities. The histological examination of the amputated section of the cervix showed interstitial œdema and numerous vascular thromboses with a few chains of streptococci. In the more superficial parts were simple lesions of a chronic inflammatory type.

As is well shown both cases, with certain differences in detail, have common similar characteristics which leave no doubt as to the existence of a hypertrophic state of the cervix to which, in the second case, is added a gener alized œdema.

Since the unsurpassed work of Huguier, vaginal and supravaginal hypertrophy of the cervix has acquired a definite place in our classifications; and when associated with prolapse it forms a distinct entity having its own symptomatology. To exclude further the possibility of confusing simple prolapse with hypertrophic elongation, I feel compelled to repeat well known ideas and to emphasize the fact that in many cases there is a spontaneous and progressive reduction of prolapse when the uterus becomes an abdominal organ during pregnancy. Under the influence of causes not

well understood, however, in patients who show a certain predisposition to circulatory changes during pregnancy, the hypertrophy of the cervix assumes the characteristics of an acute condition, and at times this hypertrophy occurs at a stage when there could be no compression or other serious disturbance of the circulation.

Rizzatti (11) saw a young woman of 22 years, pregnant 3 months, with retention of urine because of a retroversion of the uterus, the hypertrophied cervix of which protruded considerably from the external genitalia. The retroversion was corrected and the pregnancy continued to term, when labor was induced. Dilatation was effected rapidly and the fetus was extracted with forceps. After parturition, Rizatti amputated the cervix successfully. Such an early appearance of the condition is rare for in the majority of cases it is not observed until the fourth, and more frequently the sixth month of gestation. The fact, however, leads us to think that the introduction of an accidental cause is necessary to make the cervical lesion visible or to constitute a *d'emblée* and is very often the first appearance of the cervix at the vulva. The case of Varnier (17) is an example:

> The patient, a iii-para of 27 years, 7 months pregnant, suddenly felt, on standing, a foreign body at the vulva. On examination this was found to be the cervix uteri which protruded 9 centimeters and had a circumference of 21 centimeters. Scarifications were made which exuded a clear serous fluid; these scarifications were not painful in the protruding part but painful deep in the vagina. There were no cystoceles. In the Trendelenburg position manual reduction was easily accomplished. The following day nothing abnormal could be elicited by touch. Ten days later there was a sudden reappearance of the tumor but again it was easily reduced. Twenty days later there was another relapse, but the tumor reduced by simple dorsal decubitus. Labor was normal at term. The nineteenth day it was evident that the uterus was in retroversion, 12.5 centimeters with the hysterometer; there was no hypertrophic elongation of the cervix. This is a typical case of acute recurrent œdema of the cervix.

Often the strain of an exertion is the immediate cause of the condition; the 3 cases of Engstroem (4), multiparæ in which the œdema seems to have appeared after exertion and subsided with rest, the case of Seitz (14), a multipara in which the œdema recurred each time there was constipation and disappeared regularly on intestinal cleansing, sustain this assertion.

In general the œdema without previous hypertrophy has not given place to œdema during pregnancy. A tendency to relapse is quite common; the case of Varnier, just cited, is an example. The observation of Paddock (8) presents the same contingency:

> A vi-para, age 35 years, in good health, having had four pregnancies with normal labors, in the fifth month of the fifth pregnancy noted suddenly a fleshy mass, the size of a fist, protruding from the vulva; the œdema subsided with the patient in the Trendelenburg position. Several times this occurred but did not impede the labor which was spontaneous and the cervix returned to normal condition. After 2 years, in the course of another pregnancy, the œdema recurred several times, and premature delivery took place during one of the attacks. The expulsion had to be hurried because of a hæmorrhage, but was without untoward results. The tumor disappeared rapidly and the cervix regained the normal state.

The case of Jolly (7) is analagous:

> In a ii-para the first pregnancy was normal; the second was normal until the seventh month, when, without perceptible cause, a tumor of the size of a fist appeared at the vulva but disappeared spontaneously in 2 days. At term the tumor returned and was greater in size and did not tend to reduce spontaneously. It reduced slightly but not entirely, with patient in dorsal decubitus and the application of hot fomentations. Labor was somewhat difficult but terminated spontaneously. A few days later the tumor had disappeared.

This case, much like the preceding one, corresponds in certain points with the curious type described by Rouvier (12) in that the œdema affected alone the cervical lip, giving rise to a polypoid tumor. In analyzing several of the observations cited and others which have been published, the following deductions may be made as to the existence of the several clinical types as related to previous conditions of the cervix—conditions which have distinct courses.

1. The acute œdematous type in cervices previously intact has a sudden onset and has a tendency to recur; it is easily reduced and has little influence on the course of the pregnancy and labor, and the cervix becomes normal after labor.

2. The cervical hypertrophy type is infravaginal and supravaginal, or both, previous to pregnancy. In this type the œdema is insignificant during pregnancy and has little or no influence on the course of labor, save for the tendency to prolong it.

3. The mixed type. Chronic œdema with acute pressure in a cervix previously diseased. Unquestionably this type is more serious, since the observations published suggest two problems: (a) Is there a characteristic dystocia of this type? (b) Are operations on an altered cervix justifiable during pregnancy and labor?

Various observations demonstrate the existence of a dystocia.

Case of Shroeder-Benicke (2). The tumor was 15 centimeters in circumference, the head was 6 centimeters from the external cervical orifice. A Barnes' bag was inserted. Six hours later the cervix was incised and successive vaginal irrigations were made for fetid condition. Eleven hours after placing the bag, two deep incisions were made and the forceps applied and the incisions were extended during the extraction of a living fetus weighing 3,150 grams. The puerperium was febrile with puerperal mania.

Case of Sauvage (13). The patient was 41 years of age. Her first labor was normal in 1888. The second pregnancy was in 1890. At the fifth month the cervix appeared at the vulva. The labor lasted 15 hours and was normal. The procidentia decreased. The third pregnancy was in 1905. The procidentia increased until the fourth month; in the month of August she saw Sauvage and was admitted to the Baudeloque clinic. The tumor extended 4 centimeters from the vulva and was 18 centimeters in circumference; the intravaginal pedicle had a circumference of 14 centimeters, and one could clearly perceive the hypertrophy and the supravaginal elongation. In the days following, the tumor increased, becoming very œdematous (52 millimeters in diameter and 28 centimeters in circumference). The first pains appeared September 19. The membranes were felt 11 centimeters from the external os of the cervix. The labor was long and painful and it took 25 hours to secure full dilatation. Finally a fetus weighing 2,400 grams was delivered. A month after delivery, the cervix extended about 1 centimeter beyond the vulva, and the uterine cavity measured 11 centimeters with a hysterometer.

The case of Ribemont-Dessaignes and Grosse (10) was a ii-para, age 34 years, who had had one labor at term in 1900, with postpartum metritis. A little while later she noticed a hypertrophic elongation of the cervix. She had had no local treatment, but inserted a pessary. She became pregnant again at the end of October, 1903; the prolapse became corrected and after the fourth month the cervix did not protrude. Early in May, 1904 (5½ months) there was a sanguineous discharge. On May 13 the uterus was 24 centimeters above the pubes. By palpation supravaginal elongation was diagnosed. At noon on May 16 the patient lost amniotic fluid which presently became sanguineous. Uterine contractions began promptly, but as the cervix showed no tendency to dilate by 10 p.m., cæsarean section was performed. The puerperium was febrile with ultimate cure.

Balocchi (1) and Trussi (15) admit that dystocia may occur. Fleishmann (6) sectioned the cervix in 3 cases, in 1 case terminating labor with forceps and in 2 cases with cranial perforation. Boni (3), analyzing 16 cases, pointed out 15 cases in which labor was terminated by operative procedures. Sauvage (13) in 17 collected cases noted only 1 spontaneous termination, with every kind of intervention in the other 16 cases, including manual dilatation, incisions, amputations, forceps, craniotomy, and cæsarean section (twice). Potocky, in 1 case, made two large lateral incisions in the cervix and performed craniotomy as practiced by Bouilly. The puerperium was febrile with ultimate cure.

But opposed to this gloomy series is another group of authors—Martin, Howitz, Clivio, Barnes, Scarlini, Fabre and Bourret (5)—who publish normal labors.

How can we explain these diverse views? Unfortunately, in many of the observations published there exists great confusion in symptomatology. The authors do not differentiate sufficiently the cases of œdema from those of cervical hypertrophy and in these the intravaginal hypertrophy from the supravaginal. But when a differentiation is made we can distinguish two types of development.

Dystocia has almost always been demonstrated in the cases of supravaginal hypertrophy. It is well to stop and consider the mechanism of uterine accommodation to the fetus in order to understand to what extent the descent of the fetus is influenced by a long supravaginal segment, only slightly elastic, often presenting sclerotic lesions of chronic metritis. The inferior uterine segment cannot be physiologically enlarged and this explains the struggle against the cervical obstruction, not only the dystocia, but also the inefficacy of incisions in the vaginal portion only, the extension of which is almost surely fatal.

Therefore, in diagnosing cervical lesions of the hypertrophic type, especially if associated with œdema, care is the key to clinical success. In my judgment, the problem resolves itself into one of expectation, a prudent course in those cases of infravaginal hypertrophy and œdema. The question, however, becomes complicated when accidents accompany supravaginal hypertrophy.

Are we justified in operating during pregnancy? The old doctrine of *noli me tangere* in the gravid period, now has few adherents. We have all performed operations for bartholinitis, vaginal cysts, appendicitis, ovarian cysts, necrotic myomata, and have had no ill results; but in every such case we have operated in the presence of specific indications. That is not the case in supravaginal hypertrophy. Dystocia, always possible, is neither necessary nor fatal. There is a period of clinical hesitation which coincides with the period of quiescence of symptoms.

In my opinion we are not justified in doing a prophylactic amputation except in the presence of acute infections, as in my second case. Even in such cases when every precaution is exercised the operation may not stop the infection.

A large part of the success and applicability of the method rests in early diagnosis and watchfulness. There is no reason why we should not treat this type of cervical dystocia just as we do dystocia due to atresia and rigidity; the surest and quickest method is the best. Simple hysterectomy or subtotal hysterectomy, according to the extent of the lesion and the degree of the infection of the uterine cavity, gives the best results for both mother and child.

Because the lower route does not adequately remove the obstacle, I am averse to it in principle as it involves trauma and lack of precision or is long drawn out. We have seen incisions fail and the Barnes' bag fail and nothing urges one to methods of violence more quickly than the sensation of helplessness when confronted with resistance. This is true particularly with physicians who do not specialize.

Ample incisions of the cervix extending to the internal os and sufficient enlargement of the inferior segment are excellent and efficacious measures. The mere recital of these conditions explains why they failed in the cases of supravaginal hypertrophy. I prophesy that in the future there will be a larger number of cæsarean sections than in the past. This is not, however, the general consensus of opinion. Rapin, Muggia, Boni and Potocky (9) have done amputations during pregnancy. Nevertheless, Engstroem and Hansson in 3 cases reported 2 interruptions of pregnancy.

Perhaps there is a solution. We will admit that expectant measures are best in cases of supravaginal hypertrophy. When operation is done an interruption of pregnancy can rarely be avoided, and such procedures should be reserved for cases of infravaginal hypertrophy before pregnancy, provided that it be done before the fourth month of gestation. Goodly doses of morphine are administered to insure uterine repose before and after operation.

May we say a word on prophylaxis? The possibility of dystocia in the presence of hypertrophic lesions of the cervix, makes intervention imperative. Should there be present a prolapse in which the lesion is primary and is caused by disturbances other than pregnancy, such as pelvic congestion, uterine displacement, and cervicitis, amputation may be done.

But even so, this imposes certain reservations. Our conception of the relation between the cervical amputation and the gravid period must be revised. In another article (16), I ventured to refute the arguments made by Professor Pinard against the operation of Schroeder. Today I am not so sure. I have seen miscarriages and cervical rigidity after well executed amputations. For several years we followed the case of a woman on whom a correct amputation had been done in Buenos Aires. In her case the cervix was so short that by the fourth month separation had occurred and the inferior support of the opening was made accessible through the internal os.

Three abortions and a premature birth have been the consequences to date of the operation. Therefore, aside from pregnancy, one must have this contingency in mind in amputating the cervix.

CONCLUSIONS

1. Hypertrophy of the cervix may coexist with pregnancy and normal labor.

2. Acute and chronic œdema which accompany hypertrophic lesions of the cervix during pregnancy may give rise to sudden accidents that may disturb the course of pregnancy and jeopardize parturition.

3. Dystocia seems to be more frequent in cases of sypravaginal hypertrophy.

4. Except in cases of infravaginal hypertrophy diagnosed very early, expectant treatment is preferable in the absence of complicating factors.

5. Amputation of the supravaginal portion must not be advised during pregnancy. Amputation of the vaginal portion should not be made after the fourth month.

6. In cases of dystocia provoked by hypertrophic lesions of the cervix, with or without œdema, the high route is preferable to the low.

7. Simple œdema of the cervix almost always yields to rest and the Trendelenburg position. Only exceptionally is operation indicated.

8. Septic conditions may constitute an urgent indication for cervical amputation during pregnancy.

9. In performing cervical amputation when the patient is not pregnant one must bear in mind that excessive shortening, like a cicatrization due to septic causes, may interrupt pregnancy and cause cervical dystocia.

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CYSTIC INFLAMMATION OF THE VESICAL NECK AND OF THE PROSTATIC URETHRA

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POSTERIOR urethritis of the specific or non-specific type in the subacute stage very frequently reveals the presence of inflammatory cysts along the internal sphincter margin of the bladder. In fact this condition is so frequently seen cystoscopically that it is no longer of any particular interest. In addition to the inflammatory condition of the mucous membrane of the internal sphincter one usually sees a moderate or even a severe posterior urethritis. It is very unusual to find inflammation of the bladder mucosa accompanying this process, which is in contradistinction to the condition known as "cystitis and ureteritis cystica," in which most of the lesions present are found in the bladder and in the ureter mucosa.

While in the former condition the cysts are inflammatory in nature, in the latter they are degenerative, resulting from a hydropic cellular change in congenital rests or islands of epithelium (nests of von Brunn). These islands, which originally constituted the apices of some of the papillæ of the bladder or the ureter mucosa and which have accidentally become detached from their bases, are situated in the submucosa. Epithelial rests such as these become encapsulated and may remain dormant for variable periods. Changes within them are manifest when their innermost cells become hydropic, their membranes rupture, and their contents are discharged. Repetition of this process results in the destruction of more and more cells so that a section taken at this stage of development shows a cystic formation within which few motile bodies may be seen. Several investigators, as a result of this observation, have taken these bodies for protozoa and consequently have attributed the cause of cystitis cystica to a protozoan infection. The more accurate explanation of such bodies, however, is that they represent a few cells of the nest of von Brunn which have failed to undergo complete disintegration. The end stage of this process then presents cysts situated in the submucosa, protruding into the lumen of the bladder or ureter and covered only by a thin, atrophic layer of mucosa. Although the cysts in cystitis cystica may attain considerable size, they are usually small and pearly gray when seen through the cystoscope (Fig. 1).

Fig. 1. Case of cystitis cystica, showing small cysts situated about left ureteral orifice and in the bas fond of the bladder. Note the pearly white color of the lesions, and the manner in which the tiny capillary twigs course over the cysts.

After careful observation of a large number of cases of gonorrhœa, and after performing cystoscopy upon them at least once in the course of the disease, the author believes that infection of the prostate causes the cystic inflammation of the sphincter margin of the bladder and also of the prostatic urethra. It is a true contact inflammation which does not spread into the bladder or into the remainder of the urethra. Most of the cases yield to prostatic massage alternated with bladder irrigations with an antiseptic solution followed by thorough and vigorous stretching with the curved Kohlman dilator.

The following case is reported to demonstrate to what an extreme degree of cystic inflammatory changes, both the sphincter margin and the prostatic urethra are subjected as a result of prostatitis.

Case 1. V. C., age 33, chauffeur, consulted the author November 17, 1923, complaining of frequency

Fig. 2.

Fig. 2A.

Fig. 2B.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 2. Case 1. Prostatic urethra, high magnification. Note one large and one small cyst on the right wall of the urethra with the large gaping mouths of the prostatic ducts to the left of the verumontanum.

Fig. 2A. Case 1. Sphincteric margin of bladder, high magnification. Note large cyst extending over roof and right margin of sphincter.

Fig. 2B. Case 1. Prostatic urethra, high magnification. Note few residual cysts along lateral walls of urethra and evidence of cystic changes in upper part of verumontanum. Verumontanum greatly enlarged.

Fig. 3. Case 2. Prostatic urethra, high magnification. Note large polyp extending from left wall of the prostatic urethra and also the small cysts on the floor of the urethra above the verumontanum.

Fig. 4. Case 3. The urethra above the verumontanum, high magnification, showing a group of large cystic polypi arising from both lateral walls of the urethra. Note the dilated vessels on some of these polypi and over the verumontanum.

Fig. 5. Case 3. Trigone of bladder showing a cystic nodule below the interureteric ridge.

of urination every 30 minutes during the day, and 4 to 5 times during the night; pains in the back and legs, a feeling of pressure in the hypogastrium and a dragging pain in both groins. He had had an uncomplicated gonorrhœa 6 years ago but denied having had syphilis. General physical examination was negative except for a distinct prostatitis, with turbid urine in both glasses. Cystoscopic examination revealed a normal bladder and normal ureteral orifices; which were easily catheterized and the specimens obtained from both kidneys were negative. Situated along the lateral margins and the roof of the internal sphincter were groups of cysts varying in size from millet seeds to good sized peas. The mucous membrane between the cysts was red, thick, and velvety. Thick mucopus was seen issuing from the gaping mouths of the prostatic ducts in the sulci between the verumontanum and the prostatic urethra. A well developed median bar constituted the floor of the internal sphincter; and extending from this region to the external sphincter muscle, over and alongside the verumontanum, were rows of similar cysts looking like strings of pearls.

In view of the extensive nature of the lesion, it was decided to institute fulguration in addition to the routine treatment as previously indicated. It was possible in this manner to destroy several of the cysts at each séance. Cystoscopic examination made January 22, 1924, revealed the presence of a few large cysts on the roof, over the right lateral margin of the sphincter, and on the right wall of the prostatic urethra. The patient stated that the pain had dis-

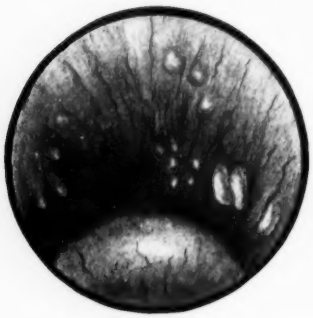

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 6. Case 4. The urethra above the verumontanum showing a beginning cyst formation.

Fig. 7. Case 5. Cystoscopic examination showed on the roof of the internal sphincter two small cysts which disappeared after a few treatments.

Fig. 8. Case 6. The urethra above the verumontanum showing tumefied reaction, to the right, and discrete linear rows of cysts in center. Note depression on left lateral margin of urethra. Also the cystic bodies on the left side of the upper border of the verumontanum.

appeared from his back and legs; the feeling of fullness in the hypogastrium and the dragging sense in the groins had also vanished and he could hold his urine for 2 hours during the day, voiding only twice during the night.

Cystoscopy done April 1, 1924, showed two cysts on the right wall of the prostatic urethra and the gaping mouth of an occasional prostatic duct (Fig. 2). The remainder of the prostatic urethra and the internal sphincter was normal. The prostate felt much better, and the fluid expressed by massage contained only a few leucocytes. Except for an occasional shred, both urines were clear. The patient's symptoms had entirely disappeared. Cystoscopy performed 2 months later showed the lesions depicted in Figure 2A and Figure 2B.

Case 2. A. T., age 33, builder by occupation, father of three healthy children, presented himself for examination April 4, 1924. His chief complaints were increased frequency and painful urination—urinating every hour during the day and 3 to 4 times during the night. These symptoms dated back 1 year, prior to which time he had never been sick except for frequent attacks of tonsillitis; venereal disease was denied. Physical examination was practically negative except for a soft and boggy enlargement of the prostate to three or four times the normal size. The vesicles were enlarged and nodular, and extended as far upward as the finger could reach. Prostatic massage fluid contained much pus, and showed streptococcus hæmolyticus and pneumococcus on culture. Urine passed into two glasses was turbid due to the presence of pus. The blood Wassermann was negative.

Cystoscopic examination showed a normal bladder and normal ureteral orifices. The latter were catheterized without difficulty and the specimens obtained were negative microscopically and culturally. Smear for tubercle bacilli were also negative and the phenolsulphonephthalein concentration from each kidney was good. Upon withdrawing the cystoscope it was noted that the posterior urethra was filled with cystic polypi of various sizes, most numerous in the urethra above the verumontanum. Arising from the left lateral wall of the prostatic urethra and projecting half way across the upper part of the verumontanum was a large polyp, portrayed in Figure 3. There was considerable enlargement of the verumontanum and the mucosa covering it was markedly œdematous, red, and velvety; the mucosa of the prostatic urethra was greatly engorged and velvety. Here and there in the sulci between the verumontanum and the urethra, mucopus could be clearly seen issuing from a gaping mouth of a prostatic duct.

Following the institution of prostatic massage and irrigations with protargol solution and fulguration of the polypi, the painful urination and nocturia disappeared, although the patient continued to void every 2 hours during the day. The urine still containing pus was much less turbi than formerly. Cystoscopy performed May 1, 1924, revealed a negative prostatic urethra, except for an occasional small polyp. The prostate was smaller, less boggy, and its secretion contained a moderate number of leucocytes to the high power field. The urine contained an occasional leucocyte and he was practically free from symptoms.

Case 2 is reported with the view to showing how marked the polypoid changes of the prostatic urethra can become from a non-gonorrhœal prostatitis, even simulating a true neoplasm. It also illustrates how quickly relief can be obtained by a combination of fulguration and prostatic therapy.

Case 3. M. L., Italian, age 23, was seen April 16, 1923. He had had what was diagnosed as an acute anterior gonorrhœal urethritis 3 months prior to this

time and after 10 weeks of intensive treatment was proclaimed cured. In view of his contemplated marriage he wished to know with certainty whether he was completely cured of the infection. He was free of all symptoms save a slight serous discharge in the mornings; past history was negative.

Cystoscopic examination revealed a negative bladder except for a small cystic nodule covered by a pinkish mucosa, situated in the trigone a few millimeters below the center of the interureteric ridge (Fig. 4). Arising from the lateral walls of the urethra above the verumontanum were a number of large finger-like cystic polypi. The mucosa between them was deeply injected and velvety. The verumontanum was enlarged but not cystic (Fig. 5).

This case demonstrates that marked cystic changes in the posterior urethra may be present without giving rise to symptoms. It also tends to show that in the course of prostatitis any subtrigonal prostatic tissue which may be present may be involved in the inflammatory process and give rise to submucosal cysts.

CASE 4. C. J., age 19, reported April 30, 1924, complaining of an occasional slight watery urethral discharge, slight burning on urination, and a slowing of the urinary stream. He was treated for an acute specific urethritis 3 years previously and following the disappearance of the discharge was given prostatic massage for 3 weeks when he was pronounced cured. The remainder of his history was unimportant. Cystoscopically the bladder was normal, but situated along the floor of the urethra above the verumontanum were a number of small grayish white flat placques. Among these it was possible to discern an occasional pearly white cystic body (Fig. 6).

A diagnosis of cystic inflammation of the posterior urethra was made; the prostate was massaged, found to be enlarged and boggy and to contain considerable pus. Following a few vigorous treatments of the prostate accompanied by through-and-through irrigations into the bladder, the patient's symptoms subsided. At subsequent cystoscopy the urethra above the verumontanum was normal.

This case presents an example of beginning cystic inflammation of the posterior urethra together with definite symptoms of posterior urethritis.

CASE 5. M. P., age 25, complained of a morning drop and an occasional shred in his urine. Physical examination was negative except for an enlarged and nodular prostate containing a small amount of pus, but no gonococci. Cystoscopic examination was negative except for two small cysts on the roof of the internal sphincter (Fig. 7), which disappeared after a few treatments.

This case demonstrates that careful inspection of the entire sphincteric margin must be made before a case of posterior urethritis is discharged cured.

CASE 6. J. C. age 29, an ironworker, presented himself on June 6, 1924, complaining of a slight morning drop and of moderate pain in the perineum. He had had an uncomplicated gonorrhœa 5 years ago, and a chancre 1 year later. Up to date he has had 24 injections of salvarsan and 32 of mercury. A Wassermann taken 3 months ago was negative. General physical examination was essentially negative with the exception of a small hard prostate which, on massage, yielded a secretion containing a moderate amount of pus.

Cystoscopic examination revealed a normal bladder. Situated over the center and right lateral wall of the supramontane urethra were a number of tortuous pinkish-white ridges which to the right were so clustered as to give the impression of a flat, papillomatous tumor. Toward the center of the supramontane urethra, however, these tortuous ridges were discrete and short, and on close study one could see that they were cystic in nature.

In the left wall of the urethra above the verumontanum, a marked cupping was seen. The left side of the upper margin of the verumontanum presented a few small cystic bodies (Fig. 8).

A diagnosis of cystic inflammation of the posterior urethra due to prostatitis was made and the patient subjected to the usual therapy exclusive of fulguration. The symptoms soon disappeared and subsequent cystoscopy revealed a definite decrease in the lesions in the urethra above the verumontanum.

This case is presented with the view of demonstrating how bizarre the lesions in the posterior urethra can be with but a slight prostatitis constituting its underlying cause.

CONCLUSIONS

1. Cysts and polypi around the internal vesical sphincter and in the prostatic urethra are frequently secondary to specific and nonspecific prostatitis.

2. Such cysts and polypi can attain very large dimensions and be mistaken for neoplasms.

3. The lesions in this condition differ from those in cystitis cystica in that they never invade the bladder and are of a purely inflammatory nature.

4. A combination of fulguration of the cysts and of local treatment for the prostatic condition will always yield excellent results in these cases.

JAUNDICE[1]

By JOHN B. DEAVER, M.D., F.A.C.S., Philadelphia

JAUNDICE may be defined as a condition in which bile is found in the blood stream and the urine, and in which the tissues are bile-stained. That part of the definition dealing with bile in the blood must be qualified, since very small amounts of this substance in the blood are normal, although the exact quantity is as yet unknown. When this amount is increased beyond a certain limit, the tissues are stained and clinical jaundice ensues. When we ask the question, however, as to the threshold upon which staining of the tissues takes place, we ask a question which cannot as yet be answered. Still another question awaiting solution concerns the quality of the bile, and perhaps it is not only the quantity but also the quality which determines the jaundice. The color of the skin, sclera, and mucous membranes in jaundice varies from light sulphur yellow to deep orange, to green and dark olive. The latter two colors are found only in severe cases of long standing. Among other conditions, jaundice is frequently attended by intense itching of the skin, by bradycardia, etc. Three problems have therefore already been brought to your attention early in this discussion of jaundice.

Jaundice is a symptom and not a disease. Since it occurs more often in surgical than in medical conditions, and particularly because surgical jaundice is usually more amenable to treatment than medical jaundice, I have upon a previous occasion been bold enough to say that more stress should be laid upon jaundice in surgical than in medical diseases. I have been led to make this statement by the fact that the pathology found at operation in patients with jaundice rarely if ever, can be removed by other than surgical means, therefore, I take this opportunity to make the surgical significance of jaundice the pith of my discussion.

Jaundice is not always the result of liver pathology alone, but is often interrelated with disease of the spleen, the reticulo-endothelial system and the hæmatopoietic system.

For purposes of convenience jaundice may be classified in a number of different ways, but I have always found the simplest and one of the most practical to be that which divides it into the painful and the painless types, for practically all cases of jaundice are either preceded by pain or have no pain at all. For example, the jaundice following obstruction of the ducts by stone is preceded by pain with the exception of the rare "silent" stone which is occasionally seen. The jaundice caused by carcinoma of the head of the pancreas is, in my experience, not generally preceded by pain, but pain we must remember is a very relative thing depending very often on the temperament of the individual sufferer. The correct interpretation, therefore, of the patient's statement that he has pain is very important, as for example, the discomfort caused by accumulations of gas in the stomach and the intestines may be real pain to some and mere discomfort to others. It is not, however, the type of pain requiring morphine for relief and this question is a most important distinction in correctly interpreting a patient's statements. It is a fact that the cause of painful jaundice is more easily determined than the cause of painless jaundice, and furthermore, since the painful type is more amenable to permanent cure than painless jaundice and ordinarily is not so serious to the patient's future, this symptom of pain becomes all the more important. It is possible to arrange the causes of jaundice in the order of frequency of their occurrence, although such tables are often hazardous and depend considerably on the character of the hospital service, the location, the racial type of patients, ages, etc. In my experience the following would be the sequence: calculous and non-calculous cholecystitis with cholangeitis, cholangeitis, chronic and acute pancreatitis, gastroduodenal catarrh, carcinoma of the head of the pancreas. Following this we find in varying order the following conditions: Banti's disease, hæmolytic icterus, carcinoma

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of the bile ducts and papilla of Vater, biliary cirrhosis, purpura hæmorrhagica, diverticulum of the common duct, nervous "shock," acute hæmolysis, ulcer of the second portion of the duodenum, pylephlebitis, infections elsewhere than in the upper abdomen, aneurysm of the hepatic artery, contracted papilla of Vater, injury of the bile ducts, infection following operation upon the biliary passages, secondary tumors of the liver, and so on. The most common type of jaundice is that of gall-bladder disease, which in our terminology means primary infection of the liver and of the large and small bile passages.

The usual form taken by gall-bladder disease is a cholecystitis of which there are two varieties, the acute and the chronic, in either of which gall stones may be present, and in either of them jaundice is comparatively rare; when present it is due usually to infection of the liver with cholangeitis or, secondly, to lymphatic infection from the gall bladder to the liver and a cholangeitis, or infection through the cystic duct into the hepatic ducts and thus also a cholangeitis. The pathologico-anatomical findings in cholangeitis are periductal infiltrates, diminution in the size of the lumina of the ducts, with the pathologico-physiologic results of obstruction to the outflow of bile, retention and entrance of bile into the blood stream and all the phenomena of jaundice. It matters little what is the cause of cholangeitis, jaundice is the result.

With this in mind it needs no emphasis, therefore, that gall-bladder disease with jaundice is a more formidable condition than gall-bladder disease alone. There have been a number of possible routes indicated by which the gall bladder may become infected, and in the past it has often been the "style" to assume that the gall bladder is infected via the blood stream, at another time via the lymphatics, and so on, with changes every few years in the mode of thought. It appears to me much more likely, however, that the gall bladder is not infected in any one way or another, but all routes are possible, and that there is no one general route. It is very likely that individuals will have gall bladders infected in their own individual ways, although it may be impossible to determine the individual routes. The importance of this conception can be brought out by rehearsing experiences such as these: when the infection in the liver is brought by way of the blood stream, it means that the hepatic cells are the first to be damaged; therefore, the jaundice following this course of events has a more serious aspect. The jaundice occurring a short time after an operation upon the biliary passages in a patient not previously jaundiced, points either to injury to the bile ducts themselves or to the spread of infection into the lymph system, the result of operative manipulation. I have seen this occur following an unrecognized injury to the hepatic or common ducts; the infection found at operation was doubtless spread by the operation itself. This can be compared to the extension of carcinoma through the lymphatics such as takes place in breast cancer (Handley). It follows, therefore, that operation upon the gall bladder must be done with the same care as removal of the breast. Dissection should work in the opposite direction to the lymph current, the gall bladder should be removed from below upward and not from above downward. I believe it is better to examine the common bile duct from within than to finger it too much from without in searching for an obstruction. Finger dissection in cleaning the axilla in a breast operation is not so good as a knife and forceps dissection. Massage is not a part of good operative technique; it may have a place after but not during the operation.

Gall-stone disease of the common bile duct with stone is always accompanied by a jaundice which, as is well known, and as I have stated, is preceded by severe pain in practically all instances. There may be exceptions to this, but they are rare.

Only recently I have had an example of this in a male patient aged 72 years, who for one year had been gradually failing, having lost 60 pounds in weight, with loss of appetite, a sallow complexion, in fact, all the indications of a slight jaundice.

When he first consulted me I was not able to determine anything by physical examination, except a large liver the surface of which presented irregular-

ities and tenderness to pressure. He was sent to the hospital for study and operation. The various tests were negative, with the exception of the urine and fæces, the former showing some bile, and the fæces a very small amount of bile. The blood picture was that of a secondary anæmia; leucocytes 12,000.

He had never suffered severe pain which explains his not having consulted a surgeon. His physicians were two very excellent internists, one of whom had treated him throughout the entire illness. Finally he was thought to have organic disease and was advised to undergo an exploratory operation. My interne who carefully examined the patient after eliciting a full history thought he had malignancy. I ventured the diagnosis of common duct obstruction after the patient told me that for some weeks he had been taking his own temperature, having been led to do so on account of occasionally having a slight chilly feeling in the evening, following which his temperature rose to 99–99.5 degrees. I asked if he had any pain before he felt chilly, he said "no," but did say that he had some discomfort in the upper abdomen, to which he did not attach much if any importance. I then asked him if he thought his urine was a little more highly colored on the next day, and whether the stool was lighter in color than usual. He answered, "Yes," and commented on this to some extent when I readily saw these two conditions had impressed him coincidentally. While he did not think he was jaundiced, he did say the whites of his eyes were a little yellow the day following the chilly feeling of the previous evening. Upon these statements I told my house doctor I thought this was a case of small stone in the common duct, and furthermore, if I were correct, the enlarged liver was caused by biliary cirrhosis. I operated 3 days after his admission. Findings: A greatly enlarged, embossed, and comparatively hard liver of an opaque color and some enlargement of the spleen, enlarged glands along the common duct, the lowermost of this chain being the size of an English walnut, the head of the pancreas enlarged but not hard, the gall bladder about half the normal size, the walls thickened and shrunken, but containing no stones. The cystic duct which was long and ran parallel with the common duct joining it behind the first portion of the duodenum, contained a small stone as did also the first portion of the common duct. The most difficult part of the operation was the freeing of adhesions about the gall bladder, the hepatic flexure of the colon, and the duodenum, in exposing the gall bladder and the ducts. These adhesions were well organized and could only be disposed of by using knife and scissors. I opened both the cystic and common ducts, extracted the stones and drained both ducts, the cystic with a straight rubber tube and the common duct with a rubber T-tube. The gall bladder and the appendix, the latter much thickened and enlarged, were removed. The tube in the cystic duct was removed in 10 days and a straight rubber tube which had been dropped into the subhepatic fossa was taken out on the fifth day. The recovery was uneventful but slow. The T-tube was removed 5 weeks after operation. Now, 10 weeks after the operation the patient is gaining rapidly, having put on 23 pounds, his appetite he says is hard to satisfy, and his skin is clear. The liver is now normal in size to percussion and palpation. This case as I have said was never the subject of an hepatic colic but showed a mild form of pain.

An unusual and yet not so uncommon diagnostic complexity is afforded by subacute inflammation of the head of the pancreas. The differential diagnosis between it and calculous obstruction of the common duct is oftentimes impossible. I have operated in a number of cases in which the diagnosis of calculous obstruction has been made by able clinicians to find at operation pancreatitis of the head of the pancreas with no obstruction from within the common duct.

Non-calculous cholecystitis presents a syndrome practically like that of the two former conditions, with the exception of the absence of pain and the more pronounced chills and sweats. One such patient remarked she perspired enough to saturate six night gowns every night. This patient never had pain, except before the first operation; she had been under my care twice before, the first operation was cholecystectomy for calculous cholecystitis, the second operation, drainage of the common duct by a straight rubber tube for cholangeitis; the third operation was T-tube drainage of the common duct for recurrence of cholangeitis, at which time she remarked that she would not allow me to remove the T-tube for a long time, saying she did not want another recurrence. This patient wore the tube for many months; she has remained well.

When jaundice appears in acute pancreatitis, it is the result of blood stream infection with damage to the hepatic cells; the excretion of infected bile causing cholangeitis.

Since the jaundice in subacute and chronic pancreatitis is due to pressure upon the terminal common duct by the head of the pancreas it can be corrected only by surgical measures.

A fairly common condition is that known as catarrhal jaundice which is the result of a gastroduodenal infection which reaches the

liver by way of the common and hepatic ducts. Were this always the mild infection it is said to be, there would be less to worry us when confronted with this condition, but the pancreas is quite frequently involved by way of the pancreatic ducts, so that there is mild inflammation of the entire organ. Where only the head of the pancreas is attacked, the infection has come by way of the lymphatics of the liver, the bile ducts and the peripancreatic lymph nodes. I have operated upon many cases of chronic catarrhal jaundice following an acute stage in which the pathology exposed was as I have described. It is therefore far from wise to allow cases of chronic catarrhal jaundice to drag along because the consequences in the shape of biliary and pancreatic cirrhosis are so close at hand, both of which conditions are amenable to a large extent to surgery but not to medical treatment. When the pathology of the liver, the bile ducts, and the pancreas is well advanced, the operation is serious and the symptoms too often recur. When insufficiency of the liver and pancreas is once established, the favorable period for surgical interference has passed. The jaundice of Banti's disease, hæmolytic jaundice, purpura hæmorrhagica, splenic anæmia, and related conditions can be corrected only by removal of the spleen. In these cases also, it is the delay and not the operation which influences the seriousness of the situation.

The jaundice of carcinoma of the head of the pancreas and of the bile ducts can be relieved only by one or another of the anastomotic operations. The exception in bile duct carcinoma is the case in which the neoplasm can be removed with restoration of the lumen of the duct, a possibility which, needless to say, is very rare.

The jaundice of choledochitis, diverticulum of the common duct and biliary cirrhosis can be relieved only by operation. Jaundice caused by aneurysm of the hepatic artery, by pressure upon the ducts from without, or traction by adhesions of the bile ducts takes a purely mechanical means to correct it. As a rule these are not favorable cases, yet a cure is occasionally obtained. In syphilitic conditions the prognosis is more favorable. The jaundice in pyelophlebitis is hopeless from every standpoint. Were it possible to recognize the condition early enough, incision and removal of an infected thrombus of the portal vein might be possible. I have had occasion successfully to repair the injured portal vein with suture, so that direct attack for removal of a thrombus is among the surgical possibilities. The most common cause of this fatal condition is appendicitis and thrombosis of the appendiceal veins; therefore, in the cases of gangrenous appendicitis with gangrene of the meso-appendix the cæcum should be dislocated forward and inward and the veins in the immediate neighborhood inspected, when if found thrombotic, they should be tied off distal to the thrombus or thrombi. I never operate, especially in the presence of a gangrenous meso-appendix, that I do not bear this in mind, as well as have a pyelophlebitis staring me in the face.

I occasionally see jaundice with duodenal ulcer where the exudate of the ulcer involves the wall of the duodenum adjacent to the terminal (interstitial) portion of the common duct, and when in addition to the ulcer there is a cholecystitis. I have met with these associated conditions a number of times. This jaundice is most likely the result of both compression by the exudate and also to cholangeitis due to lymph-borne infection from the ulcer-bearing area. By the same principle reversed, duodenal ulcer can be caused by infection carried from the liver, the gall bladder, and the bile passages.

Infection elsewhere in the abdomen than in the upper right quadrant is also occasionally accompanied by jaundice due in all likelihood to infection via the blood or lymphatic streams. Unfortunately, this is too often a serious omen with an unfavorable outcome.

I could mention a number of other operable conditions in which I have very occasionally seen jaundice such as solitary abscess of the liver, echinococcus cyst of the liver, tumor of the right kidney, movable right kidney and tumor of the hepatic flexure. It is interesting for us as surgeons to take note of the many other conditions in which jaundice may be present, irremediable to surgery and very

often to medicine. Among these are acute yellow atrophy of the liver, poisoning by arsine, phosphorus and so on, Weil's disease, icterus neonatorum, enlarged lymph nodes due to Hodgkin's disease, tuberculosis, leukæmia, etc., gumma of the liver, eclampsia, infectious diseases such as pneumonia, typhoid fever, influenza, malaria, yellow fever, relasping fever, secondary syphilis and so on. The comparative rarity of these conditions as causes of jaundice bears out my contention that the more common types are surgical and not medical conditions except as diagnostic problems. Am I not therefore correct in asking that jaundice be emphasized more in the surgical vocabularies than in the medical, and am I not correct in emphasizing and re-emphasizing that among these conditions which are remediable by surgery, all of them are fraught with serious consequences? The surgeon cannot be called too early but he can be called too late.

The jaundice occurring after operation on the bile passages is due to one or other of two things: infection spread at the time of operation, when the jaundice will appear a few days after the operation; or injury to the bile ducts when the jaundice appears almost immediately. In either event the jaundice is painless. The jaundice of infection clears up in a comparatively short time, whereas the jaundice due to an injured duct is permanent and increases in intensity thus simulating that due to obstruction by malignancy. The jaundice due to injury of the bile ducts is remediable only by operation. This alone makes the responsibility in these operations all the greater and makes imperative a comprehensive working knowledge of the topographical anatomy of the operative field. The only way surely to avoid injuring the common duct or the common hepatic duct is to expose them to the eye at the point where the cystic duct joins them, before clamping, tying or cutting the cystic duct. It is also necessary to expose separately the cystic artery before passing the ligature or placing a hæmostatic forceps. This is easily done by incising the free border of the gastrohepatic omentum and carefully reflecting both leaflets. When a duct or ducts are injured accidentally, the condition should be recognized and repair made at once; otherwise a second operation, usually very formidable, will be necessary. Repair when injury is recognized at the time of occurrence can usually be made by suture alone or suture and drainage with a rubber T-tube. When the right branch of the hepatic duct has been cut across, it is usually sufficient to introduce and retain for several days a straight rubber tube. When a second operation is necessary and the ends of the duct (hepatic or common) cannot be identified and therefore cannot be apposed and sutured with or without a drainage tube, an anastomosis will be required between the proximal end of the duct and the duodenum. When these operations are done, it is understood of course that the gall-bladder has been removed. When the common or hepatic duct is obstructed by stricture, idiopathic or traumatic, most likely the latter, incision of the duct, proximal to and dilatation of the stricture if it does not involve the entire circumference of the duct, and drainage suffices. When, however, the stricture involves the entire circumference of the duct, resection and end-to-end suture usually offers most for a permanent cure.

The preparation of the jaundiced patient for operation will include the careful study of all the organs from a physiological and pathological standpoint, which includes the chemistry of the blood, the coagulation time, the blood pressure, the heart, the kidney function, and the liver function. Study of the latter is of most moment when done in connection with the former studies. These patients as a rule are better prepared for operation if given glucose, and in some instances insulin alone or with glucose for 3 or 4 days before operation.

In patients whose urine contains acetone or diacetic acid, I hesitate to operate until the urine is free of these. Acidosis occurring after operation may be formidable and calls for prompt and heroic treatment. After the operation the aforementioned points must be kept in mind and treatment directed accordingly, if the patient is to be carried through a safe convalescence.

In all my operations for gall-stone disease I drain the subhepatic space, Morris's pouch,

or the renal well. I have never seen bile peritonitis where drainage has been used, with but two exceptions. These followed several days after operation when drainage had been used, and happily both patients recovered; one by spontaneous drainage of the collection of bile through the operative wound, and the second after abdominal incision and pelvic drainage. I have seen in consultation patients with bile peritonitis, not recognized and not operated upon, in whom drainage was not used; all of these patients died. Bleeding into the peritoneum in badly jaundiced patients occasionally occurs, but is less likely since blood transfusion and intravenous injection of chloride of calcium solution has been practised. The best time to guard against this is before operation.

FETUS AMORPHUS

Report of a Case

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FETUS amorphus is one of the rarer types of monstrosities. A case of this malformation recently studied by us led to an extensive survey of the literature. Our case has proved to be one of the most uncommon forms of this rare type, in that only the head end of the fetus developed. Not more than 6 cases of this form have been reported in the literature. It was found, further, that the cases of this type of monstrosity have not been collected and analyzed in English since Ballantyne's report in 1894. His paper was published 30 years ago in a journal that is now long since extinct and the files of which are not readily accessible. It has appeared to us, therefore, that a full review of the literature at this time might be of value. We have collected from the literature 45 cases of fetus amorphus in man and 16 cases in lower animals. To this group we have added other cases that seem to represent transition forms between fetus amorphus and mylacephalus.

A brief summary of the collected cases follows.

1. Benedetti (1), in 1533, mentions a case of fetus amorphus, but gives few details. He thought that the mass was a hydatid mole. This specimen contained no viscera.

2. Vallisneri (2), in 1733, described a fetus amorphus which was born with a mole, and not, as usual, with a normal twin. The specimen contained bones, intestine, lung, liver, pancreas, and heart(?).

3. Bland (3). The specimen was 20 centimeters in length, weighed 900 grams, had hair, rudimentary skull, 8 vertebræ, brain, and spinal cord.

4. Ehrmann (4). The specimen was kidney-shaped, 2⅓ by 1¼ inches and had hair. There was a small protuberance on the surface which contained no bone. Rudimentary skull, vertebræ, ribs, pelvis, and some bones of upper limb.

5. Glaser (5). The specimen was globose in shape. The original article was not accessible.

6. Gluge and D'Udekem (6). The specimen was "reniform," 10 centimeters in length, and had hair. The only internal structures mentioned were intestine, heart (?), and a glandular organ, probably the liver.

7. Cornil and Causit (7). An egg-shaped mass, 5 by 4.5 centimeters with hair, showed traces of vertebræ and another bony mass, either a lower jaw or clavicle; rudimentary brain; traces of nerve and skeletal muscle.

8. Calori (8). A trilobate mass, 7.5 by 6.4 centimeters with hair, contained vertebræ, rudimentary brain (?) and striated muscle.

9. Crédé (9). A globose mass, 12.75 by 12.25 centimeters, weighed 170 grams. There was hair. The sacrum and coccyx were the only bones mentioned. There was no brain nor spinal cord. There were present partially degenerated skeletal muscle fibers, loops of intestine and a glandular organ, probably the liver.

10. Kleinwaechter (10). The specimen was an egg-shaped mass, 16 by 11.3 centimeters, with hair. The original article was not accessible.

11. Freudenberg (11). The monstrosity, one of triplets, was egg-shaped, and weighed 1900 grams. Hair was not mentioned. The mass was attached directly to the placenta and except for the area of attachment was covered with skin. Sternum and clavicles were the only bones mentioned as being

present. A rudimentary brain and glands were found.

12. Preuss (12). The mass was 34 centimeters in length. The original article was not available.

13. Kroner and Schuchardt (13). The kidney-shaped mass, 20 by 12 by 7.5 centimeters, weighed 1220 grams, showed rudimentary vertebræ and femur, intestine, skeletal muscle, and gland epithelium.

14. Noeggerath (14). A mass 10 by 40 centimeters presented no bone but striated muscle.

15. Lehmann (15). The mass was kidney-shaped, 15 by 9.5 centimeters, weighed 1000 grams, and presented hair. Base of the skull, several vertebræ, sacrum, one iliac bone, a rudimentary brain, intestine, kidneys, peritoneal cavity, a rudimentary urinary bladder, and a lung(?).

16. Neugebauer (16). The mass was egg-shaped, the size of a fist, with hair, a pelvis, rudimentary lumbar vertebræ, traces of a spinal cord, a heart (?), and a penis-like appendage.

17. Graetz (17). A globular mass, 8 by 4 centimeters, weighed 115 grams. It presented skull bones, 15 vertebræ, ribs, pelvis and brain substance.

18. Boldt (18). An egg-shaped mass, 9.5 by 7.5 centimeters, had hair and one bone which resembled a phalanx of a finger. There were no viscera.

19. Hermann and Bluett (19). An egg-shaped mass, 6 by 4.5 centimeters, showed hair and traces of spinal cord and vertebræ.

20. Heller (20). A mass shaped like a small apple, 6.5 by 3 centimeters, presented one bone, like the head of a femur, hair, intestine, a glandular organ like a liver, and a rudimentary heart (?).

21. Ballantyne (21). An egg-shaped mass, 10 by 8 centimeters, with hair, weighed 260 grams. It was a confused mass of bone and cartilage, intestine, and striated muscle.

22. Hirst (22). This was an oval mass. No further details were given.

23. Schiller (23). A mass, 22 by 15 centimeters, weighed 2,020 grams. There were present a skull, vertebræ, ribs, and a rudimentary pelvis.

24. Webster (24). A pear-shaped mass, 16.5 by 11.5 by 6 centimeters, presented hair, rudimentary vertebræ and (possibly) bones of an upper limb, rib, and a questionable rudiment of heart and kidney.

25. Muck (25). The original article was not accessible. This was a true amorphus.

26. Krautwig (26). This was a fetus amorphus with intact external genitals. No other details were given in the report.

27. Charlton (27). A mass, 19.5 by 14 by 5.75 centimeters, weighing 740 grams, presented the small part of the base of a skull, several vertebræ, ribs, a pelvis, continuous thoracic and peritoneal cavities, and no viscera. An X-ray plate was made.

28. Kinoshita (28). This case was one of triplets. No other details were available.

29. Dienst (29). This mass was triangular in shape, with lanugo hair. No details as to internal structures were given.

30. Webster (30). This mass, 4.5 by 2.5 centimeters was oval and had hair. It was one irregular mass of bone, possibly the base of the skull.

31. Guéniot (31). It was a flattened ovoid in shape, and had hair. No bones and no cavities were mentioned. Skeletal muscle(?) was present.

32. Hunziker (32). The mass was 11.75 by 8.5 by 5.5 centimeters, and weighed 300 grams. It contained base of skull, vertebræ, ribs, pelvic bones, brain, kidney, skeletal muscle, lymph glands, and nerves. An X-ray plate was made.

33. Schwalbe (33). The mass, 14 centimeters long, presented the base of a skull, vertebræ, ribs, lower jaw, femur, rudiment of brain, and skeletal muscle. An X-ray plate was made.

34. Meyer (34). This specimen contained bone, musculature, a nervous system, a pleuroperitoneal cavity, a urogenital tract, and lymph glands.

35. Kalmykow and Obrastzow (35). A mass, the size of a fist, accompanied a twin showing hypospadias. The original article was not accessible.

36. Birnbaum (36). There was a picture of a fetus amorphus but no details as to structure in the text.

37. Mueller(37). The mass, 11.5 by 10 centimeters, contained the base of a skull, vertebræ, ribs and scapula, brain, spinal cord, and an anlage of intestine.

38. Garrigues (37). The mass, 8 by 7 by 5 centimeters was the upper part of a skeleton with a fluid filled cavity.

39. Gruenbaum (38). The specimen was the size of a billiard ball. No bone was mentioned. There was a small mass of striated muscle.

40. Riesel (39). A kidney-shaped mass, 14.5 by 11 by 10.5 centimeters, presented hair, base of skull, vertebræ, shoulder girdle, rudimentary brain and spinal cord, small bits of cartilage surrounded by skeletal muscle, intestine, anlage of respiratory tract, and heart muscle(?). An X-ray plate was shown.

41. Stewart (40). The mass was "shaped like the trunk without head or limbs," measured 14 by 9.5 by 7.5 centimeters, and contained base of skull, 18 vertebræ, ribs, pelvis, no body cavities, liver, intestine, kidney, testes, ureters, and lymph glands. Hair was present. An X-ray plate was shown.

42. Dugal (41). A mass, 3½ by 1¾ inches, with hair presented a skull, vertebræ, ribs, shoulder girdle, pelvic bones, brain, and spinal cord. A heart was said to have been present. The twin was an acephalic monster.

43. Phelan and Abbott (42). The fetus, one of triplets, was shaped "like an enormously magnified lima bean," 12 by 8 by 8 centimeters (after hardening). There were present hair, a jaw with 7 teeth and, probably, part of the base of the skull, a mouth, a tongue, and eye-clefts. An X-ray plate was shown.

44. Slemons (43). The specimen, kidney-shaped, 6 by 4 by 2 centimeters, was attached to the placenta by a pedicle. The surface of the mass was not

covered with skin. There was a small bone with epiphyseal cartilage, but no rudiments of any organs.

45. Pok (44). No bone was mentioned. There was a rudiment of intestine, a testicle, kidney, and adrenal, striated muscle, and lymph glands.

The following cases of fetus amorphus have been reported in lower animals.

I. IN CATTLE

1. Ruysch (45). The original article was not accessible.

2. Gurlt (46) described 2 cases. These were somewhat asymmetrical amorphous masses, largely covered with hair. Cartilage and bone were present but too irregularly formed to permit identification. Only fat, connective tissue, and blood vessels were evident.

3. Bland-Sutton (47). This specimen showed no bones on X-ray examination, and was largely covered with hair. No further details were given.

4. Anthony and Salmon (48). No details as to shape, size, or internal structure were given. The specimen showed an eye with a crystalline lens.

5. Schmincke (49). This was an egg-shaped mass, 16 by 7 centimeters, with lower jaw and teeth, scapula, humerus, and intestine. An X-ray plate was shown.

6. Schmincke (49). A triangular shaped mass, 11 by 11 centimeters the dorsal surface of which was covered with hair, presented a rudimentary tibia and fibula, humerus, pelvis, anlage of mouth, upper lip, and tongue; and intestine. X-ray plates were shown.

7. Schmincke (49). A spherical mass, 11 centimeters in diameter was partially covered with hair. The lower jaw was only bone. A "penis anlage" was present.

8. Schmincke (49). An egg-shaped mass, 15.1 by 11 centimeters, was hairy on one side. It presented an anlage of the pelvis, and a bony mass that could not be identified, possibly a lower jaw. An X-ray plate was made.

9. Schmincke (49). A disc-shaped mass, 9 by 3.4 centimeters, presented one small hemp-seed-sized bony mass. An X-ray plate was made.

10. Schmincke (49). An elliptical shaped mass, 18 by 10 by 1.5 centimeters, contained one bony mass the size of a pea and two the size of a cherry. An X-ray plate was given.

11. Schmincke (49). A spherical mass, 18 centimeters in diameter, partly covered with hair, contained two unidentified bony masses. An X-ray plate was shown.

12. Schmincke (49). A long oval mass, 10 by 4 centimeters, covered with hair, presented an unidentified, cherry-seed-sized bony mass. An X-ray plate was shown.

II. IN A GOAT AND SHEEP

1. Schmincke (49). A "long round" mass 10 by 8.5 by 1.8 centimeters, covered with hair, had two small projections possibly representing anlage of limbs, a scrotum, probable anlage of pelvis, sacrum, and one lumbar vertebra. An X-ray plate was shown.

2. Schmincke (49). A flattened, egg-shaped mass, 8 by 3 centimeters, covered with hair, presented two very small unidentified bony masses. An X-ray plate was shown.

3. Doran (50) mentions a fetus amorphus of a sheep in the museum of the University of Edinburgh.

III. IN A BIRD

1. Tur (51) described very briefly an amorphus embryo of a rook ("corbeau freux").

These 61 cases in man and lower animals are distinctly instances of fetus amorphus. In the following 11 cases there were anlagen of one or more limbs, which fact excludes them from the group of true fetus amorphus. But these anlagen were so rudimentary that the specimens could not be classified as distinct mylacephalus. These cases, therefore, appear to represent a borderline group between amorphus and mylacephalus.

1. Vrolik (52). The mass was egg-shaped with rudimentary lower extremity, hair, vertebræ, ribs and pelvis, rudimentary brain and spinal cord, striated muscle, nerves, intestine, rudimentary urinary bladder, rudimentary gland, and possibly a liver.

2. Barkow (53). A mass, 10 centimeters in length, presented a rudimentary left upper extremity, vertebræ, ribs, cartilaginous suggestions of bones of extremities, mouth, rudimentary eyes and nose, and gland structure probably liver.

3. Spliedt (54). A cake-shaped mass, 16.3 by 11.3 centimeters, had a small projection on the rump thought to be a rudimentary lower limb, vertebræ, ribs and femur, lower jaw, skeletal muscle, intestine, and a rudimentary kidney.

4. Sangalli (55). A mass shaped "like the grub of a moth," 30 centimeters in length, presented hair, three small projections (one with a rudimentary nail), base of skull, vertebræ, ribs, pelvis, femur, tibia and fibula, rudimentary brain, skeletal muscle and intestine.

5. Panum (56). A mass, 7.5 by 5.3 by 3 centimeters, presented a skull, vertebræ, ribs, clavicles, pelvis, and rudiment of right arm.

6. Hirschbruch (57). An egg-shaped mass measured 11 by 9 by 6.8 centimeters. One area, 2 by 8 centimeters, was covered with cylindrical epithelium; elsewhere it was covered with normal skin. There was a small projection, possibly a rudimentary limb, and fine lanugo hair on one end. There was a nodular, egg-shaped bony mass with a ring-shaped mass on its upper end. Small endothelium-lined cysts were in the skin. No muscle, nerves or organs were found.

7. Meyer (34). A mass, 6.2 by 2.5 by 3.5 centimeters, presented two very rudimentary lower limbs and external genitals, femur, pelvis, shoulder girdle and irregularly formed vertebræ, hair, brain, trace of spinal cord, intestine, rudimentary œsophagus, trachea, kidneys, urinary bladder, prostate gland, rudimentary liver and pancreas, and lymph glands.

8. Commandeur and Jarricot (58). A bilobed mass, weighing 720 grams and measuring 22 by 14 centimeters, presented lumbar vertebræ, pelvis, and bones of leg and foot.

9. Sitzenfrey (59). This specimen showed a rudimentary lower limb, vertebræ, ribs, rudimentary base of skull, pelvis, and bones of leg. An X-ray plate was given.

10. Heyl (60). A mass weighing 200 grams, measuring 9 by 8 by 3.5 centimeters, presented a rudimentary anlage of a lower limb with sole of foot, rudimentary jaw and teeth and lip, intestine, respiratory tract, adrenal, kidney, ovary, brain, and spinal cord.

11. Riesel (39). A mass, elongated-round in shape, 13 by 8.5 by 5 centimeters, weighing 360 grams, presented hair, suggestions of upper and lower limbs, rudimentary skull, femur, tibia, fibula, metatarsal bones and phalanges, and part of pelvic girdle. No vertebræ were mentioned and no organs found. An X-ray plate was shown.

To the above group of cases collected from the literature we add the following case studied by us.

This specimen was extruded from the uterus of a young primipara about 15 minutes after she had given birth to a normal male infant weighing 7 pounds, 5 ounces, and measuring 50 centimeters in length. There was only one placenta which, unfortunately, was destroyed before there was an opportunity to make a study of it.

This fetus amorphus was an ovoid mass measuring 14 by 10 by 9 centimeters and weighing 835 grams. The upper pole was rounded and covered with dark brown hair about 2 centimeters in length. The lower pole ended in a blunt point. The umbilical cord was attached 1 centimeter below the midpoint of the anterior surface. The entire surface of the mass was covered with skin except for a horizontal depression 3.5 centimeters laterally and 6 to 9 millimeters perpendicularly, located on the left half of the anterior surface 0.5 centimeter above the place of attachment of the cord. The right lateral surface of the mass was rounded, the left somewhat flattened.

The horizontal depression mentioned above had a rounded upper margin and a somewhat angular lower edge. It was approximately 1 centimeter in its greatest depth. The skin ended about 1 to 2 millimeters from its margins. The lining of the depression was red in color and granular in appearance. Its wall varied in thickness. In the bottom of the depression this measured from 3 to 4 millimeters in thickness and separated the depression from one of the cavities inside the mass. On the left lateral half of its upper margin, there was a solid, rounded projection, 6 millimeters in diameter. On incising this mass after hardening it in formalin, we found that it contained a hard oval mass having the shape and general appearance of a crystalline lens. Microscopic examination disclosed in the posterior part a structure resembling retina. This mass, therefore, represents a rudimentary eye.

On the anterior part of the upper half of the specimen there were three cyst-like bulgings, varying from 6 to 18 millimeters in diameter. We opened the mass and the bulgings were found to occupy the locations at which smooth-walled, fluid-filled cavities lay immediately beneath the skin.

X-ray pictures of the mass showed it to contain bony structures which appeared to be a rudimentary base of the skull and three vertebræ. The lowermost of the vertebræ ended in a knob-like projection.

Sections of the mass showed it to be composed chiefly of pearly gray, very œdematous connective tissue with a considerable amount of fat in the lower third of the mass. Three separate cavities are present. The largest cavity is of irregular shape, measures about 8 by 5 by 4.5 centimeters in its greatest diameters and is composed of several smaller communicating cavities. It lies chiefly above the bony structure that appears to represent the base of the skull, and probably represents the cranial cavity. One of the smaller communicating cavities extends downward into the upper end of the vertebræ and is the rudimentary spinal canal. The walls of this irregular cavity are composed of a dense membrane, firmly atached to bone where this is present, and its inner surface is smooth and glistening, except at its lowermost part, that

Fig. 1. Photograph showing the right and anterior surfaces of the fetus amorphus. The larger of the two round masses just above the rudimentary mouth is the rudimentary eye.

Fig. 2. X-ray plate showing the rudimentary base of the skull and three (or four?) cervical vertebræ.

is, in the depths of the rudimentary spinal canal. Here the lining is lusterless, soft and measures 2 to 3 millimeters in thickness. Sections from this soft portion are found to be made up of glia cells among which are a very few ganglion cells. This is the only part of the cavity that shows anything resembling central nervous system. Anteriorly and above, this irregular cavity approaches the surface very closely in several places so that its lining is practically in contact with the skin. These places are the sites of the cyst-like bulgings described above.

Posterior to the rudimentary base of the skull is a smaller cavity, measuring 2 by 3 centimeters, with a smooth lining beneath which are several large branching blood vessels. Immediately below the lining membrane of the lower part of this cavity is a mass of fat.

Below and behind the lower end of the rudimentary vertebræ is a third small cavity, 3 by 1.5 centimeters with a lining that is rather lusterless and thrown into low folds. It has not been possible accurately to identify either of these smaller cavities.

On microscopic examination we can make out no organs except the eye and the very small mass of brain or spinal cord mentioned above. Sections from the anterior part of the mass show an area in which there are a few scattered fibers of striated muscle. Otherwise the sections contained only œdematous connective tissue, fat and blood vessels. In the skin of the upper pole there are hair follicles and sebaceous and sweat glands.

In this specimen, therefore, all of the recognizable structures were rudimentary. They consisted of a mouth, eye, base of the skull, vertebræ, and either brain or spinal cord. Hair, hair follicles, sebaceous and sweat glands, a few fibers of striated muscle, blood vessels, fat, and connective tissue make up the structures found in this specimen.

Including our own specimen we have 46 cases of fetus amorphus in man, and 16 in

lower animals. In all instances the malformed fetus was the product of a multiple pregnancy. In three of the human cases, it was one of triplets (Freudenberg, 11; Kinoshita, 28; and Phelan and Abbott, 42). In one case (Vallisneri, 2) the other twin was a hydatid mole; and in another (Dugal, 41), an acephalic monster. In one case (Kalmykow and Obrastzow, 35) the viable twin showed hypospadias.

The details of many of the reported cases are too meager to be of much value in an analysis. In 26 cases, the shape of the human fetus amorphus was stated as follows: egg-shaped, 6; kidney-shaped, 8; globose, 4; trilobate or triangular, 3; oval, 3; like an apple, 1; pear-shaped, 1. In 12 cases occurring in the offspring of the cow and goat the shape was described as egg-shaped, 3; asymmetrical, 2; spherical, 2; oval, 2; elliptical, 1; disc-shaped, 1; triangular, 1.

The lengths of the fetus amorphus in 31 human cases are shown in Table I.

TABLE I.—LENGTH

Length in Centimeters	Number of Cases
4.5 to 5	2
5.1 to 10	10
10.1 to 15	11
15.1 to 20	5
20.1 to 25	1
25.1 to 30	0
30.1 to 35	1
35.1 to 40	1

The smallest specimen was that of Webster (30) which measured only 4.5 centimeters in length; the largest was 40 centimeters in length (14). In 21 of the 31 cases the length of the fetus amorphus ranged from 5 to 15 centimeters. Of 8 bovine amorphi, the length ranged from 9 to 18 centimeters.

The weight of the human fetus amorphus was stated in 12 cases. These are tabulated in Table II.

TABLE II.—WEIGHT

Weight in Grams	Number of Cases
Less than 500	4
500 to 1,000	5
1,000 to 1,500	1
1,500 to 2,000	1
2,020	1

The lowest weight recorded was 170 grams (Crédé, 9); the greatest, slightly more than 2 kilograms (Schiller, 25). Nine of these 12 specimens weighed 1,000 grams or less.

The results of X-ray examination of the human fetus amorphus have been published in 7 cases, including our own (Charlton, 27; Hunziker, 32; Schwalbe, 33; Riesel, 39; Stewart, 40; Phelan and Abbott, 42).

In 37 of the above cases the record is sufficiently complete to be of value in analyzing the findings in this type of monster. The relative frequency of development of different organs in fetus amorphus is shown in Table III.

TABLE III.—FREQUENCY OF DEVELOPMENT OF DIFFERENT ORGANS

Organ	Cases	Organ	Cases
Skin	36	Brain	13
Hair	22	Spinal cord	6
Vertebræ	19	Peripheral nerve	2
Base of skull	15	Striated muscle	14
Ribs	9	Intestine	11
Pelvis	9	Heart muscle	7
Unidentified bone	6	Kidney	6
One or more bones of shoulder girdle	4	Liver	6
Jaw	3	Lymph glands	4
Sacrum	2	Peritoneal cavity	3
One or more bones of the arm	2	Lung	3
One or more bones of the leg	2	Testicle	2
Sternum	1	External genitals	2
Teeth	1	Rudimentary glands	2
Mouth	2	Bladder	1
No bones	5(?	Adrenals	1
		Pancreas	1
		Eye	2

All of the 37 cases included in Table III consisted of an amorphous mass covered with skin except that of Slemons (43). This specimen was attached directly to the placenta, there being no umbilical cord. Hair was specifically mentioned in 22 cases. In some instances it measured 2 inches in length. In all cases the growth of hair was limited to one pole of the amorphus. All of the specimens were composed chiefly of œdematous connective tissue containing blood vessels and more or less fat. One or more bones or bony masses were described in all except 5 cases. In Noeggerath's (14) case it was specifically stated that no bone was present. In the cases of Gućniot (31) and of Gruenbaum (38) no bone was mentioned and the description suggests that none was present. Gluge and D'Udekem (6) and Pok (44) did not mention bone but the fact that these specimens con-

tained rudiments of other highly differentiated organs would suggest that bone also had been formed but for some reason was not noted in the record of the case. Of individual bones vertebræ and one or more bones of the base of the skull were most commonly found. In no case was the skull complete. Brain and spinal cord, always as very rudimentary structures, were stated to be present in 19 cases. It is interesting to note that the most highly differentiated tissue in the body, namely, the central nervous system, is so common a finding in this type of monster. Next to rudimentary brain and spinal cord in frequency was striated muscle. Of rudimentary organs, other than those mentioned above, intestine was most frequently encountered (11 cases). Of special significance is the fact that heart muscle was specifically mentioned in 7 cases. Fetus amorphus is classed as one variety of acardiac monster. In none of the cases recorded, however, was the heart sufficiently developed to function. It may also be permissible to question whether the muscle which was designated as rudimentary myocardium may not have been ordinary striated muscle.

Schwalbe (33) stated that the development of the head end only of the fetus amorphus rarely predominates, and he believed that only 4 well authenticated cases were on record at the time of his writing. In addition to our own case which showed only the base of the skull and three rudimentary vertebræ, the following cases appear to fall into this rare category: Bland's (3) specimen contained the base of the skull and 8 vertebræ. In that of Cornil and Causit (7) there were traces of vertebræ and a bone which might have been either lower jaw or clavicle. In Mueller's (36) case there were skull base, vertebræ, ribs, and scapula, with brain and spinal cord. Riesel's (39) case showed base of the skull, vertebræ, shoulder girdle and brain, and spinal cord. In the case of Phelan and Abbott (43) the only bony structures were the jaw with 7 teeth and an osseous mass that was thought to be a part of the base of the skull.

The development of only the lower end of the trunk appears to be even more uncommon than development restricted to the cephalic

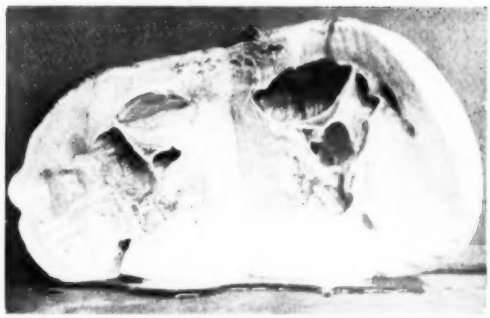

Fig. 3. Showing the surfaces made by cutting the amorphous mass almost in the sagittal plane. The glia tissue and ganglion cells were found in the lowermost part of the large cavity seen in the right lateral half of the specimen.

end of the fetus. In the case of Crédé (9) the only bones present were the sacrum and coccyx. There was no trace of central nervous system. The specimen of Kroner and Schuchardt (13) contained several vertebræ and a femur, but no central nervous system. Neugebauer's (16) case showed pelvic bones and rudimentary lumbar vertebræ, with a small amount of spinal cord.

Fetus amorphus in lower animals (cow and goat) presents certain differences from the corresponding human monstrosity. In the human cases, the bony structures appear to have been more fully differentiated. Of the 14 cases in these lower animals, one contained no bone at all, and in 7 others only irregular masses of bone were present that could not be identified. Also the development of bone in the human amorphus was more massive and abundant than in the specimens from the cow and goat. No trace of cranial bones were found in any of the cases from lower animals, and in only one case was there formation of vertebræ. No central nervous system was developed in any of these animals, while this structure was a very common finding in the human cases. As in the human specimens the intestine was the most common of the viscera developed.

Fetus amorphus belongs to the acardiac group of monsters, of which there are the following varieties:

1. Amorphus or anideus, an allantoido-angiopagous twin that has never acquired the

external form of a fetus and appears as a rounded, skin-covered mass.

2. Mylacephalus, a more or less amorphous mass with slight suggestions of one or more limbs.

3. Acormus, development of the head only; usually attached directly to the placenta.

4. Acephalus, trunk and limbs more or less well developed but head entirely absent.

5. Anceps or paracephalus, head very imperfectly developed, trunk and limbs fairly well developed.

The term fetus amorphus was first used by Gurlt (46), and this type of monster was first fully described by Geoffrey St. Hilaire (61) in 1839. Fetus amorphus is always a product of twin or triplet pregnancy. The co-twin or co-triplets are usually normal, viable, and are generally born first. When the amorphus is one of twins, there is one placenta to which both cords are attached; when it is one of triplets, there are generally two placentæ to one of which the cords of the amorphus and of one normal fetus are attached. Fetus amorphus is one of uni-ovular and monochorionic twins. The amnion may be either single or double. In the umbilical cord of the monster there are only two vessels, one artery and one vein. The mother is usually a primipara, as in our case, or at least there is no history of previous twin pregnancies. The pregnancy is usually normal and is not shortened. As a rule, the labor is not abnormally difficult.

The etiology of fetus amorphus is probably the same, in general, as that of all other types of acardiac monsters. Three theories have been advanced.

1. Meckel (62), Darest (63), and Panum (56) believed that failure of the development of the heart in one of the twins was the primary condition, and that the fetus amorphus survived only in those cases in which an anastomosis was formed between the vessels of the two umbilical cords.

2. Claudius (64) and Ahlfeld (65) thought that the anastomosis between the vessels of the two cords of the fetuses was the primary factor. Hunziker (32) believed that the anastomosis was artery to artery and vein to vein, so that the circulation in the amorphus twin was reversed. The motor force of one fetus overpowered that of the other and the heart of the weaker became more or less completely obliterated. The amorphus twin thus becomes a sort of parasite on the normal twin (43).

3. Schatz (66) believed that this type of monster usually resulted from some interference with the return flow of blood from the placenta to the twin which later became the fetus amorphus.

Of these three theories, (1) primary deficient development in the germinal layer, (2) contest of strength between the hearts of the twins through anastomosis between the vessels of the cords with overpowering and atrophy of the heart of one twin, and (3) abnormally small blood vessels in the cord of one twin with anastomosis with those of the other, the second is the theory that is now generally accepted.

SUMMARY

A specimen of one of the rarer types of fetus amorphus is described in detail. This was a kidney-shaped mass covered with skin, with a growth of hair on one end, a rudimentary mouth and eye, and the rudimentary base of a skull and three vertebræ. The mass was composed chiefly of œdematous connective tissue, with blood vessels and fat, and with a few fibres of striated muscle and a very small mass of glia cells and a very few ganglion cells.

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INIENCEPHALUS—A CAUSE OF EXTREME DYSTOCIA[1]

By W. A. NEWMAN DORLAND, A.M., M.D., F.A.C.S., Chicago

DIFFICULTY in parturition ranges from the slightest variation from the normal to grades of severity that jeopardize the life of the mother or child, or both. It is doubtful if in any given parturient woman more complicating factors are apt to be encountered than were met with in the case I am about to relate.

A CASE OF EXTREME DYSTOCIA

The patient, Mrs. S. S., a large, well built primipara, 32 years of age, had presented no symptoms during her gestation to awaken any suspicion of the trouble that was to be experienced from the very beginning of labor. Almost with the first labor pains there occurred a spontaneous rupture of the bag of waters. When I saw her at 6 o'clock in the evening she was having pains at about 5-minute intervals. An examination made at this time revealed a face presentation of the left mento-anterior variety. Fetal movements, I was informed, had not been felt for about 24 hours, nor was I able to detect the fetal heart tones. By 11 o'clock cervical dilatation was almost complete, but there had been no descent of the chin, and no engagement of the presenting part had taken place. An attempt was now made to perform a podalic version, but it was found impossible to pass the hand beyond the great bulk of the fetal thorax. As no further progress in engagement and descent occurred and as the pains became extreme in intensity, it was decided to perform a craniotomy, since the fetal heart tones were not discernible. This maneuver was readily accomplished, under ether anæsthesia, by perforation through the left eye, valuable assistance being rendered by Doctors Weaver and Pike. Notwithstanding complete decerebration, collapse of the fetal skull did not follow. However, with the fingers hooked into the facial skull-bones, upon which traction was made, aided by firm pressure upon the fetal buttocks above, the head was slowly drawn down and delivered. Considerable difficulty was experienced in extracting the well developed and closely fitting shoulders, which tightly filled the vaginal canal. As the body of the child emerged, either because of suction produced by the closely adjusted fetal parts or because of the pressure exerted by one of the assistants upon the uterine fundus, or because of a combination of these factors, a complete inversion of the uterus occurred, the cavity of that organ rolling out of the vagina with astonishing rapidity. The placenta was quickly stripped from its site of attachment, the fundus was replaced without difficulty, and a firm gauze packing was introduced to prevent a recurrence of this accident. It was then found that free bleeding was taking place from a small vestibular tear situated above the urinary meatus; this was controlled by a running suture of catgut. There was a moderate perineal laceration which it was deemed best, under the circumstances, not to touch at the time. It was repaired a week subsequent to the labor. The patient was returned to her bed, and, with the exception of a sudden rise of her temperature to 101 degrees F. on the morning of the fifth day, with as sudden a drop to normal, the convalescence was uneventful. An examination of the fetus revealed this remarkable monster which weighed, after the craniotomy, 9 pounds 6 ounces, or 4,252 grams.

As I have already suggested, the combination of difficulties encountered in this labor, namely, an elderly primipara, dry labor, face presentation, failure of engagement and descent of the presenting part, unusual fetal bulk, craniotomy, uterine inversion and vestibular hæmorrhage, all due to the presence of a very large and rare fetal teratism, presents an almost unique picture of extreme dystocia.

STATISTICS OF INIENCEPHALUS

The condition of *iniencephaly* is very rare. Down to the time of Geoffroy Saint-Hilaire, in 1836, there were but 3 cases known. Ballantyne had met with but 7 cases in 1904. Our fellow member, Dr. Henry F. Lewis (1897), in a paper read before the Chicago Pathological Society, in December, 1896, collated all the cases recorded in literature, 22 in number, to which he added a case of his own and 2 specimens in the museum of Rush Medical College. Since then there have been published the records of 10 additional cases – those of Burton (1897); Hirst (1897); Abbott and Lockhart (1905), 3 cases; Hunziker (1911); Vallois (1914); Wheeler (1918); Michel (1919); and Hayes (1922). To these I now add this case of my own and 2 unrecorded specimens, 1 in the collection of the University of Chicago and 1 in the possession of the Chicago Lying-in Hospital. This gives a total to date of 38 iniencephali.

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Evans' specimen, in the McGill University collection (*Abbott and Lockhart*, 1905), was a small female showing a marked retroflexion of the head, the occiput merging with the back at a point 4.25 centimeters above the anus, the face looking almost directly upward. The fetus measured 39 centimeters in length. Both ears were abnormal in shape; the extremities were flexed closely upon themselves, and there was a left talipes varus. In the middle line of the back just below the occiput was a round, bluish-red elastic nodule the size of a bean indicating the spina bifida.

A second case in the McGill University collection (*Abbott and Lockhart*, 1905), was a full-term female fetus of large size, measuring 33.5 centimeters from the heel to the middle of the anterior fontanel, the retroflexed head becoming continuous with the back in the intrascapular region 8.25 centimeters above the anus. The lower extremities were flexed upon themselves; the face looked obliquely upward, the anterior fontanel upward and backward. The trunk was well nourished. There was an umbilical hernia the size of a walnut, a marked talipes equinovarus of the left foot and a slight one of the right foot, and a lordosis of the lumbar and lower dorsal regions. The roentgenogram showed the basis cranii high up and the occiput adherent to the bodies of the vertebræ in the lower dorsal region. The mother of the fetus was rickety and a victim of cerebral syphilis.

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Fig. 1. Dorland's case of iniencephalus showing craniotomy through the eye.

at the twelfth dorsal and first lumbar vertebræ, the arches of which were present and formed a bony roof to the greatly enlarged vertebral canal. Because of the left inclination of the head, the ribs on the right side were widely separated, while those on the left side were closely jammed together and deflected downward, causing a defect in the bony framework of the anterior chest-wall.

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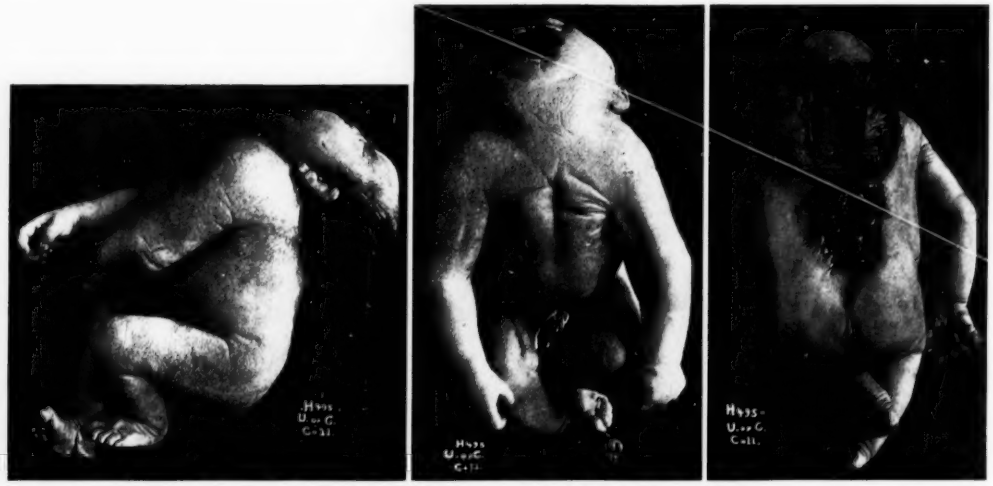

Fig. 2. Iniencephalus (Bartelmez). University of Chicago collection.

Michel's case (1919) was a breech presentation with spontaneous delivery in a vi-para, 40 years of age. The other 5 children were normal. The fetus was premature, measuring 28 centimeters in length and weighing 1,500 grams; it showed the typical defects of iniencephalus in the upper spine.

Hayes' specimen (1922) was 38 centimeters in length, the length of the head and body being 23 centimeters. There was a condition of hydrocephalus, no neck, and a diaphragmatic hernia. There was a typical deformity of the spinal column, including the unclosed neural arches and the excessive size of the foramen magnum. There were no external signs of protrusion of the contents of the spinal canal, and the integument was unbroken from the occiput to the sacrum. The craniovertebral axis, extending from the anterior extremity of the nasal septum to the last sacral segment, measured 16 centimeters, and formed practically a straight line save for a short anterior convexity at about its middle portion. The eleventh thoracic to the fifth sacral vertebræ could be distinguished; the fifth lumbar vertebra was partly fused with the first sacral. The foramen magnum measured 6 centimeters in its anteroposterior diameter. There was present the rare condition of a complete vertebral cleavage with an uncleft occiput. At the cephalic extremity of the craniovertebral axis could be distinguished the mesethmoid, presphenoid, basisphenoid and basi-occipital bones, and the cartilaginous anterior arch of the first cervical vertebra. The foramen magnum was formed anteriorly by the basi-occipital bone and laterally by the ex-occipitals to which were united the neural arches of the fused vertebræ; and posteriorly by the supra-occipitals which were united behind the spinal cord opposite the fourth lumbar vertebra.

The Lying-in Hospital specimen, as reported by Dr. Serbin, was obtained from a ii-para, 31 years of age, who showed a moderate degree of pelvic contraction. The first child was normal. The present labor was premature, at 6 months, and the fetus was delivered spontaneously in the occipitodextroposterior position. There was an adherent placenta which required manual extraction. The fetus was a female weighing 1,120 grams. The radiograph of this monster shows no evidence of a syphilitic osteochondritis.

Hirst's specimen (1897) was described as typical of iniencephalus.

Bartelmez's specimen, from the collection at the University of Chicago, was a large female of about full term showing extreme retroflexion of the head, the face looking directly upward. The occiput was adherent to the spine as far as the last dorsal vertebra. Immediately below this point was a meningocele extending down to the sacral region. The spina bifida reached from the cervical to the upper sacral vertebræ. The characteristic defects of the base of the skull could be seen.

My own specimen is a large full term female fetus, apparently perfectly developed in every way with the exception of the craniovertebral axis, which shows the characteristic features of iniencephalus. The occiput was adherent as far down as the upper lumbar vertebræ. There was a slight appearance of the spina bifida below this point, but no meningocele. The facial mutilation resulting from the craniotomy and subsequent traction is evident.

CHARACTERISTIC FEATURES OF INIENCEPHALUS

This monster, according to Taruffi (1889), Schwalbe (1909), and others, must be grouped in the class of rhachischisis, or fissuring of the spinal column, which includes *exencephalus*, with its subvarieties, and *iniencephalus*. Generally, there is present an occipital encephalocele or a spina bifida with a protrusion of the spinal meninges (Hayes). The deformity consists of three cardinal features, namely, a backward displacement of the head and a

posterior bending of the spinal column, which have given to the condition the term "retroflexion of the fetus"; a varying degree of spina bifida, affecting the upper spine; and a defect of the posterior portion of the skull in the region of the foramen magnum. According to Schwalbe (1909), it is very rare to find all the vertebral neural arches ununited; the commoner type is accompanied by a cleavage of the occipital region of the skull; he also emphasizes the exceedingly interesting feature of fusion of the ex-occipitals with the vertebræ. The craniovertebral axis is much shortened and forms practically a straight line from the nasal septum to the sacrum (Hayes); there is, in consequence, a displacement of the viscera downward. The shortening of the vertical column is due to an irregular fusion or, more correctly, a failure in the separation of the cervical and thoracic vertebræ. The neural arches of the vertebræ are deficient, all failing to unite posterior to the spinal cord. The ribs are more or less fused to one another and to the vertebræ from which they arise.

Fig. 3. Roentgenogram of author's case.

ETIOLOGY OF INIENCEPHALUS

Nothing is known as to the cause of the abnormal development. The older authorities, Foerster, Meckel, Morgagni, Haller, Virchow, and others, attributed the defect to the presence of hydrocephalus and hydrorhachis. More recently, the amniotic theory has gained ground, and this view is substantiated in a measure by Abbott and Lockhart's statistics.

Apparently, the primary condition is the fissuring of the spine, the failure of closure of the vertebral arches appearing to be caused by the dorsal displacement of the occiput. The absence of the neck is directly due to the shortening of the spinal column; and the diaphragmatic hernia, observed by Hayes (1922) and others probably results from the same cause. Hayes suggested that the spinal malformation may be due either to pressure by the amniotic fluid or, when that is deficient, to pressure from the uterus itself; he thinks it is more probable, however, that there is some inhibition of growth in the fetal spine, and that the deformity does not result from extraneous forces.

If it is assumed that iniencephaly results from a spinal arrest of development (Child's and Stockard's theory), then we must look for an embryonic stage in which there is a dorsal concavity in the vertebral axis (Hayes' theory).

Such a stage is represented by His's embryo of 3.2 millimeters, aged about 3 weeks. Inasmuch as embryos showing this dorsal (thoracic) concavity are themselves regarded as abnormal, it may be readily perceived that if iniencephaly is the result of developmental arrest at this stage, it must necessarily be a very rare occurrence.

RADIOGRAPHY OF INIENCEPHALUS

The specimens of iniencephalus which have been X-rayed show the characteristic occipital and spinal defects. The occiput can be seen fused to the vertebral bodies as far down as the lower dorsal or even the lumbar or sacral regions.

The lordosis is evident in all cases, and

the fission of the vertebræ posteriorly also can be plainly seen.

THE OBSTETRICAL SIGNIFICANCE OF INIENCEPHALUS

As may be noticed from the clinical histories of the cases, not every monster of this type gives rise to trouble at the time of delivery. Most of the cases are premature, and the small fetuses are delivered spontaneously after comparatively short labors, notwithstanding the presentation by the face or the breech. An anterior chin presentation may readily be delivered without any difficulty. Nevertheless, as was shown in my own case, it is quite possible for extreme dystocia to result from the monstrous development in full term fetuses of this variety of teratism.

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ENTEROLITHS AND DIVERTICULA, ESPECIALLY ENTEROLITHS CONTAINED IN DIVERTICULA OF THE LARGE BOWEL

Report of a Case[1]

By MILES F. PORTER, M.D., F.A.C.S., Fort Wayne, Indiana

THE writer has met with four cases in which enteroliths were etiological factors in the condition for which he was consulted. In two the enteroliths were of biliary origin, both produced acute obstruction of the bowel by obliteration of the ileum, and both were cured by enterotomy. Two were enteroliths of fæcal origin, both caused partial bowel obstruction, and both were lodged in diverticula of the large bowel: one in the rectum, which was cured by removal of the enterolith through the anus; and the other in the cæcum. The latter case is reported.

Mrs. P. H., age 60 years, entered the hospital April 18, 1924, with a history of partial obstruction of the bowel extending over a period of many months. Some 15 years before she had had an attack of acute abdominal trouble centering in the right lower quadrant. The patient was fairly nourished and showed on examination nothing save a palpable mass in the cæcal region. She had no areas of tenderness and no fever. White blood count showed 14,750, neutrophiles 77 per cent. X-ray examination showed "filling defect" at the cæcum. A diagnosis was made of cancer of the cæcum. Through a right rectus incision, a large, hard mass containing the lower ileum, cæcum, and appendix was removed and a side-to-side anastomosis done. During the operation and after the removal of the tumor, it was remarked that the diagnosis of cancer was "undoubtedly correct." A tube was placed in the ileum to prevent distention, a rubber tissue drain was placed near the anastomosis, and the wound was closed.

Examination of the mass after operation proved it to be made up of bowel firmly bound about a diverticulum of the cæcum. The diverticulum contained an enterolith about the size of an ordinary hickory nut. Unfortunately, after an ordinary reaction, the patient gradually sank and died of exhaustion 6 days after the operation.

Postmortem examination revealed gangrene of the operative region which contained anastomosed gut. The area seemed entirely shut off from the general cavity of the abdomen. No sign of peritonitis was present. The illustrations show the location of the diverticulum and enterolith (Figs. 1 and 2). The mouth of the diverticulum before removal of the enterolith was no larger than the end of a lead pencil, but it was dilated and the enterolith was removed before the picture was taken. The enterolith was of fæcal origin.

Coerr (1) says that he was able to find only one case of fæcal enterolith recorded in the

Fig. 1. Specimen removed at operation. Cæcum cut open showing diverticulum at *a*, containing enterolith. *b*, Match in lumen of appendix. *c*, Appendix. Reduced one-half.

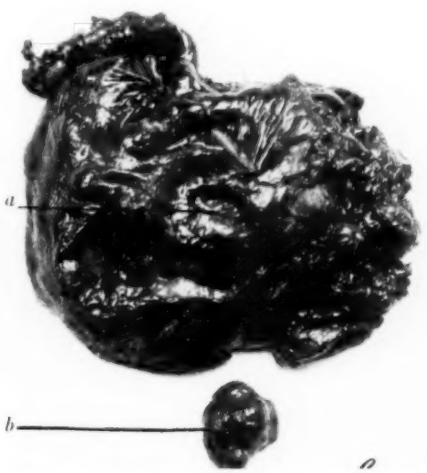

Fig. 2. Same as Figure 1 with enterolith removed from diverticulum, *a*, and shown below, *b*. Reduced one-half.

Read before the Western Surgical Association, French Lick Springs, Indiana, December 5, 1924.

literature since 1899. He says, however, that enteroliths of fæcal origin are not rare among the aged insane. He reports a case of obstruction of the bowel by a fæcal enterolith in a young girl. Rogers (9) also reports a case in which a fæcalith was lodged in a diverticulum of the colon. W. J. Mayo (6) says that "hardened masses of fæces are often found in diverticula."

While this paper is chiefly concerned with diverticula it might be well to say in passing that many if not most of the enteroliths found in the small bowel are of biliary origin and that in making the diagnosis in these cases, a history of previous cholecystic trouble is significant. McLean (7) in his paper on diverticulum of the duodenum, remarks on the likelihood of food particles lodging in them, and he cites one case in which twenty gall stones were found.

It is generally conceded that diverticula of the large bowel are "comparatively frequent" (10), and it would seem that diverticulum of the large bowel containing enteroliths is not a very rare condition. Diverticulum of the cæcum, however, is relatively rare. The writer has met with but the one case out of more than a dozen cases of diverticula of both the large and small bowel. Gant (3) reports but one case of diverticulum of the cæcum out of seven cases of diverticula seen by him. French (2) reports three cases of diverticulitis of the cæcum and remarks that, while this condition is rare it is one of great interest because of the difficulty of differentiating it from "tuberculosis, malignant disease and appendiceal abscess." In one of his cases the correct diagnosis was made prior to operation. While diverticula of the other portions of the large bowel are frequently multiple, those of the rectum and cæcum are usually single.

Out of 9 cases of rectal diverticula reported by Gant (4), all were single save one, and in that case two diverticula were present. This author says that of 11 cases of rectal diverticula reported by Felling, the majority were, from the description given, evidently sigmoidal, and he reminds us that that portion of the colon which is situated in the pelvis and has a peritoneal covering and mesocolon and which was formerly described as the upper third of the rectum, is in reality a continuation of the sigmoid and that diverticula located here should be designated as sigmoidal.

The diagnosis in diverticulitis of the large bowel is rather difficult. The most frequent error seems to be to mistake diverticulitis for malignancy or *vice versa*. The writer has made the former mistake twice; according to W. J. Mayo the same mistake has occurred three times at Rochester; and Schwyzer reports a like mistake; while in one of French's cases the reverse mistake was made. It should be remembered that cancer and diverticulitis frequently coexist and that the latter is frequently the cause of the former.

Mayo says that malignant degeneration occurs in about 31 per cent of the cases of diverticulitis. To Hochenegg (5) is probably due the credit of first calling attention to the fact that diverticula may result in carcinoma. It is of interest here to note that Nothnagel (8) described a case in which a diagnosis of either sarcoma or tuberculosis was made and in which at autopsy both cond tions were found in addition to several diverticula. It is no doubt true, as has been pointed out by many authors, that in some cases in which diverticula and carcinoma coexist the latter may be the cause of the former, although it is no doubt true that in the majority of instances the carcinoma is the result of the diverticula. Simple intestinal diverticula usually produce no symptoms and are discovered only by accident through the opened belly or during the course of an X-ray examination. A thorough X-ray examination will reveal their presence in a large proportion of cases. However, in many cases the diagnosis is not completed until a laboratory examination is made.

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GAS GANGRENE IN CIVIL PRACTICE

With a Report of Three Cases

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GAS gangrene, or active infection with a gas-producing organism, is relatively rare, especially in civil practice, and exact figures, statistics of morbidity, mortality, and methods of treatment, even since the World War, are comparatively rare.

Maisonneuve (13) in 1853 gave the first academic description of gas gangrene. Bloodgood (2) as late as 1899 could find only 22 cases to summarize. And the disease remained unusual and rare until the recent opportunity for multiple, contaminated, "dirty" wounds in the fields of Belgium and France.

Welch, in 1892, cultivated a bacillus from autopsy which he called bacillus aerogenes capsulatus. This is a long anaerobe (6 by 2.5 microns) gram-positive, with square ends, non-motile, occurring clinically usually in symbiosis with streptococci and various aerobic saprophytes. The bacillus of malignant œdema was described by Pasteur, in 1877, and termed the vibrion septique. Other organisms have been described although it is probable that many names have been given to different members of a group.

These or similar organisms have been found frequently in fields, in the intestinal flora, on clothing, in fact they seem to have a rather wide distribution. Taylor (16) reports the bacillus in 70 per cent of a series of war wounds. Stitt (15) therefore remarks that it is questionable whether the pathogenicity is other than exceedingly feeble. The isolation of a large, gram-positive organism from a deep or lacerated wound is generally considered diagnostic, with or without clinical symptoms.

The most reliable method of culture is inoculation of the suspected material into the ear vein of a rabbit, quick killing of the rabbit, and incubation at body temperature. If the organism is present, in a few hours the rabbit will be blown up with gas, and eventually be literally blown to pieces, with the offensive odor of spoiled meat.

In wounds, the bacillus grows usually only with some aerobic organisms (which remove the inhibiting oxygen?) or in the presence of foreign bodies, dirt, fragments of clothes, bullets, or crushed or otherwise devitalized tissues. The muscles quickly assume a dirty, brick red color, loose their power of contraction on mechanical stimulation, and the blood supply is cut off by thrombosis of the vessels. Thus again the oxygen tension is lowered. Bowlby (3) states that he has never seen gas gangrene of the head (where the blood supply is best) and almost never in the neck. The gas itself is probably non-toxic, and merely mechanically allows further invasion of the separated fibers of muscle and tissue, and prepares the way for the production and absorption of the hæmolytic and destructive toxins. The cause of death is not a blood invasion of the organism, but a severe general toxæmia with local necrosis.

Wallace says that it is, first of all, a disease of muscle, and spreads later to contiguous tissue. It is known to follow muscle bundles, rather than jump even a short distance through fascia to attack contiguous though separate muscle groups. Early after the infection starts comes the characteristic crepitus of the affected tissues, with the production of gas that will burn, being 60 per cent hydrogen. Bowlby (3) quotes cases with well marked infection 5 hours after injury, with death from gangrene of the entire limb in 16. Usually clinically the process occupies 24 to 48 hours, but develops with great rapidity.

In the war, it was most frequently seen in wounds of the buttock, then in order of frequency, in the thigh, leg, arm, forearm, and foot; very seldom in the hand and rarely in the face, neck, chest, and abdomen. It was reported in from 1.5 to 3.0 per cent of war wounds. The mortality varied from 9 to 50 per cent, depending on the length of time between injury and treatment.

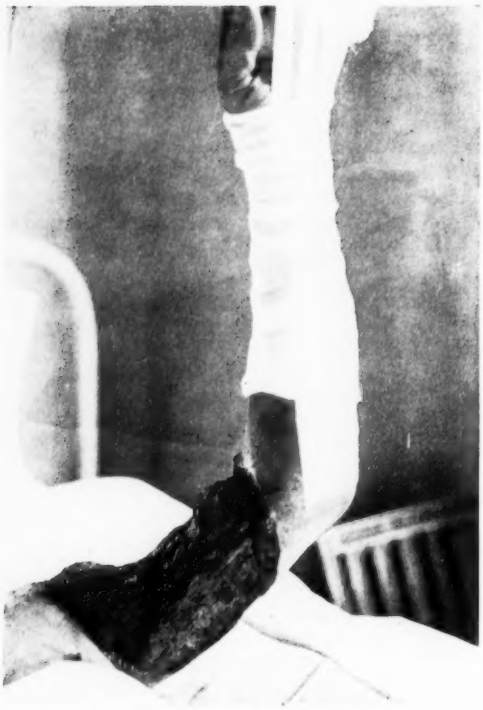

Fig. 1. Case 1 after débridement.

Fig. 2. Case 1 after skin grafting had been performed.

In Europe, therefore, the infection and clinical picture of gas gangrene was common. But it is practically unknown in England and Scotland. Keen (11) did not see a single case in the Civil War, and up to 1917, only one case in civil practice. C. E. Black (1), in reporting 5 cases in 10 years of private practice, rightly states that many physicians have not seen a single case. Pickard (14) of Kansas City says he has seen only 3 cases in 15 years of railroad surgery. Fairbrother (5) had only one case of gas gangrene in a great many years of railroad and general surgical practice. Guthrie (8) in reporting 8 cases, with 3 recoveries, finds that it occurred in but 1 to 644 cases treated at Bellevue Hospital, between 1909 and 1911. He also states that Lothrop of Hazelton (12) in an active accident service had seen but 7 cases. Wilkins (18) of Wilkes-Barre City Hospital had never seen a case. Wainright (17) of Scranton has seen but 5. The cases reported here are 3 in 2,814 admissions to the Mary McClellan Hospital between 1918 and 1924, or a ratio of 1 to 938.

While most cases occurring in civil practice are found to complicate crushing wounds, gunshot wounds and compound fractures, the condition is not unknown as a sequel to operative surgical measures. Gilpatrick (6) reports a case of extensive gas gangrene involving the perineum, scrotum, and thighs, following a clamp and cautery operation for hæmorrhoids with incision of an ischiorectal abscess. Hotchkiss (9) cites cases of infection following the subcutaneous injection of salt solution, and mentions a fatal case appearing on the passage of a sound 5 days after an external urethrotomy.

Keith Ingles (10) divides cases occurring in civil life into two classes according to the mode of infection. In the first group, infec-

Fig. 3. Case 2, showing extent of destruction.

Fig. 4. Case 3, showing the type of injury.

tion is due to organisms from the soil, originally from animal fæces. In the second group, infection is from the patient's own intestinal flora, and is most frequently found in cases of criminal abortion (4 cases given).

Treatment has been developed largely since the experiences of the recent war. Early, the rule was to amputate high above the involved tissue, as soon as the diagnosis was made. Later it was found that free and radical incision, removal of the affected tissue, with any foreign bodies, free drainage, and the introduction of various antiseptics would be sufficient for a majority of the cases, giving as low a mortality with less mutilation. Depage used injections of oxygen. Lawson and Whitehouse, and others have been successful with hydrogen peroxide, injected in and above the lesions. The majority are content with Carrel-Dakin technique. The mortality rate gradually dropped in the series of cases treated during the war, as the methods and technique became better known.

Bull and Pritchett (4), of the Rockefeller Institute, obtained a serum against bacillus welchii, with striking laboratory results and less successful clinical outcomes. The British used a polyvalent serum, containing antibodies against bacillus welchii, bacillus œdematiens, the vibrion septique, and bacillus tetanus. Goodman (7) reports a recent case treated with serum from a commercial laboratory, with recovery. Theoretically the serological treatment would seem logical, but the case reports in prophylaxis and treatment are not altogether clear.

The case histories are as follows:

Case 1. J. F. S., a farmer, age 64, referred by Dr. Z. Orton, Salem, New York. On the morning of the day of admission, the patient while working in his barn, was caught in the flywheel of a gasoline engine, lacerating his arm in a frightful manner. There were two extensive lacerations of the scalp. The skin had been stripped from the shoulder, from the insertion of the pectoralis major to the external condyle of the humerus. Nearly the entire anterior and medial aspects of the arm were denuded. The biceps muscle was torn across at its middle. The coracobrachialis and the brachialis anticus were torn and crushed. The bone, the brachial artery and motor nerves were intact.

Immediately after admission to the hospital, the severed muscles were united by mattress sutures of chromic gut, ample rubber tissue drains were introduced, and wet dressings applied. Later in the day, there appeared a copious dark red discharge and it was noticed that the odor was foul. Cultures were taken and a pig inoculated. By the next morning the odor of gas gangrene was unmistakable. Subcutaneous crepitus was present to the axilla. The contiguous skin was brick red in color. Smears from the wound showed large numbers of large gram-positive organisms. some containing spores.

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The guinea-pig inoculated the night before and incubated for 12 hours was enormously swollen and distended with gas. Organisms similar to those of the wound were in the liver and heart's blood.

Immediate operation was performed and the biceps muscle was dissected out, from its origin to its insertion, and a large portion of the brachialis anticus and the coracobrachialis, as well as the axillary contents were removed. Dakin's solution was introduced at frequent intervals. More devitalized tissue was removed on the following morning, and the emphysema was found to be stationary in the pectoral region. From this time on, there was steady improvement. The wound healed by granulation, and 3 weeks later, skin grafting was done. The result was satisfactory from a functional standpoint; the patient is able to do his farm work with practically no impairment of power or skill.

Dakin's solution and thorough débridement seemed to be the two factors that made recovery possible. The bacilli disappeared from the deeper portions of the wound in 36 hours after the Carrel-Dakin treatment was instituted. The temperature reached a maximum of 103 degrees, with a pulse of 135 during the first 24 hours, and then dropped to slightly above normal for the remainder of his stay in the hospital. White blood cells, 10,000; polymorphonuclears, 78 per cent; transitionals, 15 per cent; lymphocytes, 7 per cent. Red count normal.

Case 2. H. E., age 3. While playing in his father's farmyard, the patient caught his hand in a pulley, through which a rope was passing, severely injuring the hand. He was brought to the hospital 1 hour after the injury. There was extensive laceration over the dorsum of the right hand, with great loss of substance and ragged edges, the entire area covering 20 square centimeters. There was a compound fracture of the proximal phalanx of the little finger, with crushing of the soft parts, and the fingers were cyanotic. The extensor tendon of the ring finger was torn, and the metacarpophalangeal joint was laid open.

The wound was cleaned, swabbed with iodine, and wet dressings applied. The next morning, 16 hours after injury, there was noticed the characteristic foul odor of gas gangrene, and the soft parts of the little and ring fingers were necrotic and crepitant. Smears showed organisms morphologically similar to Welch's bacillus. Anaerobic cultures and animal inoculation confirmed this diagnosis. The following morning, there was crepitus, brick red discoloration and œdema on the dorsum of the hand. Long incisions were made on the dorsum of the hand, through all involved tissue. Dakin's solution was applied 16 hours after the injury was received. After the second operation, the condition improved, and the wound healed by granulation.

Case 3. F. W.. age 23. This patient was accidentally shot in the foot and lower leg, receiving a full charge of small shot at fairly close range. He was received at the hospital 4 hours after injury, suffering from shock and loss of blood. The lower half of the leg was found to be riddled with shot holes, a false point of motion was present at the junction of the middle and lower third, and there was considerable swelling of the lower two thirds of the leg, and the ankle. The X-ray showed a comminuted fracture of both bones of the leg, in the lower third.

Twenty-four hours after the accident, the leg was swollen up to the knee with a brawny infiltration which did not pit on pressure. No definite crepitus was elicited. The temperature rose to 103 degrees and the pulse to 110. Thirty hours after the injury, there was an unmistakable odor of gas gangrene and amputation was performed at the mid-thigh. The patient's temperature continued at 102 degrees for 2 days and then gradually subsided. There was no extension beyond the level of amputation. Anaerobic cultures in glucose agar developed much gas in 6 hours. Recovery was uneventful.

SUMMARY

Gas gangrene in civil practice is relatively rare. It usually follows traumatic wounds with crushing of tissue, especially muscle, and contaminaton with clothing or soil, which has been in contact with animal excreta.

Three cases occurring in civil practice are reported. One was treated by amputation and two by thorough débridement and Carrel-Dakin technique. All recovered.

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CARCINOMATOUS OVARIAN TERATOMA WITH PREMATURE PUBERTY AND PRECOCIOUS SOMATIC DEVELOPMENT

By ROWLAND H. HARRIS, B.A., M.D., F.A.C.S., F.R.C.S.(Edin.), Battle Creek, Michigan

A GIRL 5 years and 10 months old, who had a carcinomatous teratoma of the right ovary associated with sexual and somatic precocity, came under my care April 1, 1914. The tumor was removed the following day, and now after ten years and eight months this patient is in good health and free from discoverable recurrence.

A first report of the case was made in Surgery, Gynecology and Obstetrics in May, 1917. Further history is given in the present paper.

B. R., born of German parentage, May 23, 1908, weighed 6 pounds at birth and grew at a normal rate until she was 4 years of age. When 5 years and 10 months old she weighed 58 pounds and was 49.8 inches tall, weight and height which are given by Bowditch and by Seaver as those of the average girl of 9 years of age. She was 20 pounds above the average in weight, and 8.3 inches taller than the average girl of her age. Table I, showing the average weight, height, and span of arms for girls 5 to 16 years of age, will permit of further comparison.

TABLE I.—AVERAGE WEIGHT, HEIGHT, AND SPAN OF ARMS FOR GIRLS FIVE TO SIXTEEN YEARS OF AGE

From Hastings' Charts, Given by Seaver

Age	Number of observations	Weight in pounds	Height in inches	Span of arms in inches
16	355	110.83	62.2	62.35
15	459	102.77	61.75	61.8
14	534	94.42	60.3	60.25
13	534	83.46	58.5	57.9
12	526	72.73	55.9	55.45
11	522	63.94	53.2	52.7
10	517	59.89	51.7	50.8
9	534	54.90	49.7	48.5
8	531	48.88	47.3	46.2
7	514	45.64	45.7	44.1
6	352	40.80	43.2	42.2
5	183	38.19	41.5	40.3

When the patient was 5 years and 12 days old, she had a menstrual period, which was followed by six other periods of the 28 day type, profuse and painful, each lasting 1 week. The next two periods were missed. After the first period, the breasts grew larger, the areolæ darkened, hair appeared in the axillary and pubic regions, and the whole body developed rapidly and symmetrically.

At the time of the third period, a small abdominal tumor was discovered, which in the next 6 months grew to such size that the patient had the appearance of being pregnant at full term. She was referred to me with a diagnosis of pregnancy, but on examination the normal uterus was easily palpated separate from the tumor. Pregnancy was suggested by the enlargement of the breasts and abdomen, by the missed periods, by the ease with which vaginal examination was made, and by nausea and vomiting which were caused by toxic absorption and by the large size of the tumor. There was no lactation in this case, such as has been observed in some other cases of teratoma.

At operation the uterus and left appendages were found normal, the large tumor of the right ovary was free from adhesions, and there were no peritoneal or glandular metastases. There was an excess of peritoneal fluid. The right ovary and tube and the appendix were removed, and the patient made an uneventful recovery.

PATHOLOGY

The tumor was irregularly globular and smoothly encapsulated, had a broad pedicle 2.5 inches long, weighed 4 pounds and 4 ounces, measured 7 inches in long diameter and 5.5 inches in transverse diameters. It was composed of two masses of solid tissue which were separated by two large cysts filled with thick gelatinous semifluid contents. In the solid portion of the tumor there were many small cysts, and three small bones of compact texture resembling miniature cranial bones.

Dr. A. S. Warthin, of the University of Michigan, examined the tumor and found embryonic lung tissue, neuroglia tissue, and nerve cells, tissue resembling the gastrointestinal tract, islands of cartilage, and dermoid cysts containing hair, sebaceous and sweat glands. There were structures from all three germ layers, ectodermal, mesodermal, and entodermal. The larger part of the growth presented the appearance of adenocarcinoma, showing in some places solid medullary masses of carcinoma with areas of necrosis.

Subsequent history. Since the operation the mental and physical development of the patient have been normal. At the present time she feels

perfectly well, lives on the home farm, and attends school in a neighboring town 5 miles away, where she is a junior in the high school. The fortunate circumstance of residence nearby has permitted follow-up examinations at intervals. She has had whooping cough, chickenpox, measles, and the grippe. The tonsils have become hypertrophied, and lately small adenomata have appeared in the thyroid gland.

After removal of the ovarian tumor the breasts became small and there was no menstruation and no noticeable growth of the breasts or of the pubes until the appearance of normal puberty at the age of 12 years and 9 months.[1] Since that time the periods have been fairly regular with interval 28 days and duration 7 days, occasionally prolonged a day or two. Usually there are backache and pain in the pelvis the first day. For a short time when she was 14 years old, the periods came every 2 weeks and lasted 3 days.

Measurements showing rate of growth for 1 year after removal of the tumor, and for the past 20 months, are given in Table II.

TABLE II.—MEASUREMENTS OF PATIENT GIVEN IN INCHES

Age	Lengths		Breadths				Depths	
	Height	Spanof arms	Chest	Waist	Shoul-ders	Hips	Chest	Abdo-men
5 yrs. 10 mos.	49.8	48.0	8.9	7.4	10.9	8.8	5.5	5.6
6 yrs. 10 mos.	49.8	49.2	8.6	7.0	12.1	8.7	5.6	5.2
14 yrs. 10 mos.	63.9	64.0	10.0	8.5	14.5	10.5	5.5	6.5
16 yrs. 6 mos.	64.25	64.7	10.5	8.7	15.2	11.5	5.7	7.5

Age	Girths								
	Neck	Upper chest	Lower chest	Expan-sion of chest	Waist	Thigh	Calf	Arm	Fore-arm
5 yrs. 10 mos.	11.0	22.5	22.8	1.0	*25.5 / 21.0	13.0	7.8	7.2	6.5
6 yrs. 10 mos.	11.1	24.5	20.0	2.0	19.5	13.5	9.0	7.1	7.0
14 yrs. 10 mos.	12.0	30.5	26.5	2.5	24.7	18.0	11.0	9.0	7.7
16 yrs. 6 mos.	13.2	31.5	27.5	2.5	26.5	19.2	12.0	9.0	8.0

*Before and after operation.

In the year following operation this patient did not grow in height, although span of arms, breadth of shoulders, and girth of chest increased. It may be safely concluded that growth was accelerated by the presence of the tumor and retarded for a time after its removal.

In the 10 years and 8 months which have elapsed since the operation, she has gained 14.4 inches in height, an average yearly gain of 1⅓ inches, a rate below the average for girls from 6 to 16 years of age. At 16 years and 6 months of age, she is 64.2 inches tall and her net weight is 110 pounds.

That rapid growth in this patient was not a family characteristic but was due rather to some hormone effect of the tumor is shown by the fact that her only sister, who is now 11 years old, has grown at a normal rate, and now weighs 75 pounds and is 55¼ inches tall. In neither father nor mother has there been any abnormal rate of growth.[2]

Examinations made November 23, 1924, revealed no evidence of any recurrence of the tumor. Bimanual examination showed the pelvic organs normal except for retroversion of the uterus into the left side of the pelvis. X-ray plates of the chest showed nothing to suggest any pulmonary metastasis. The liver and spleen were normal in size, and no abnormal masses were palpable in the abdomen. There were no large lymph glands in neck, axilla, or groin. Blood and urinary findings were normal.

Freedom from recurrence would now seem practically assured. The tumor was histologically as malignant as any other carcinoma, and the patient is safe simply because operation took place apparently before there was any metastasis. The history of this patient would indicate that a malignant tumor may attain large size without the occurrence of metastasis.

Recurrence in cases of teratoma may appear as implantation metastasis in the peritoneal cavity or as metastasis in the retroperitoneal glands or in the liver, lungs, or other organs. The metastases may be large and contain many of the component parts of the primary tumor, or they may take the form of innumerable miliary nodules consisting principally of a single variety of tissue.

Seyfarth, in considering dermoids and teratomata of the ovary in children up to 15 years of age, assembled 171 ovarian tumors of which only 23 were classified as teratomata. Of 20 patients operated upon for teratoma, 11 died of recurrence in 6 months, 3 were released after a short time apparently cured, in 2 nothing was known of results, 3 were free from recurrence after 1 year, and 1 was free from recurrence after 2 years.

In the 21 collected cases of ovarian teratoma occurring in girls 14 years old or younger, which were tabulated in my first paper, only 2 patients were recorded as living beyond 1 year. One of these died of metastasis in the liver 16½ months after operation. The other patient, that of Sjoevall, was well 7 years after operation.

Luftspringer has tabulated 43 cases of ovarian dermoid and 4 of ovarian teratoma

[1] The pubic hair which had been shaved preparatory to the operation did not become abundant again until menstruation was re-established.

[2] The father weighs 140 pounds and is approximately 6 feet tall. The mother weighs 108 pounds and is 5 feet and 6 inches tall.

observed at the Breslau Clinic from April, 1904, to April, 1916. One of the teratoma cases was a girl 13 years old in whom there had been no bleeding and no precocity.

Croom, of Edinburgh, in considering premature sexual development in relation to ovarian tumors, reported a case of round-cell sarcoma of the ovary in a girl of 7 years, and discussed the differential diagnosis from pregnancy. The girl had been raped by a boy, and there was profuse hæmorrhagic discharge from the vagina which continued uninterruptedly for 7 months. There was growth of pubic hair and the breasts were large. After removal of the tumor, which weighed 6 pounds, there was no vaginal hæmorrhage.

Siegel reports a case of sarcoma of the right ovary in a girl 8 years old in whom there was abnormal growth of hair and of the genitalia.

Of all the cases of precocious puberty collected by Reuben and Manning, 23 were known to have had malignant tumors of the ovary. The question may be raised as to whether or not there is a relationship between the malignancy and the precocity.

Askanazy in his paper on "Chemical causes and morphological effects in tumor patients, with special reference to sexual precocity," considered embryonal teratoma a kind of pseudo-pregnancy and suggested that the product of fetal tumor tissue promotes maturity and incites precocious development of the genitals. According to his views, the production of precocity is not a function of the organ affected by the tumor, but a function of embryonic tumor tissue, although only certain embryonic tissues will produce precocity. Embryonal teratomata vary in the quantity and quality of their material, and this may account for varying degrees of prematurity in various cases. He stated that teratomata of the pineal gland, testicles, ovaries, kidneys, lungs, and perhaps also of the suprarenal capsules, in boys and girls, have been found associated with manifestations of sexual precocity.

Harvey reported a case of precocious sexual development in a girl 2½ years old with a history of regular menstrual periods for 9 months. The precocious development was due to a large cellular and vascular sarcoma of the left kidney and suprarenal gland.

Comby believes that precocious maturity is probably due to premature activity of the interstitial cellules of the ovary, the activity of which is produced either by some intrinsic factor or by the effects of a hormone of the pituitary, the pineal, or the thyroid gland.

Krabbe thinks that tumors in the pineal body and suprarenals probably cause the production of certain metabolic substances which have a stimulating action on the interstitial cells of the testicles and ovaries. But the normal suprarenals and pineal body probably have no special function in this respect.

Ewing, in a paper on teratoma testis, refers to cases of teratoma testis reported by Warthin and by Gabauini in which hypertrophy of both breasts and secretion of colostrum occurred and thinks it reasonable to interpret these phenomena as physiological signs of pseudogestation in the male subjects of these tumors.

It is hoped that this case of ovarian teratoma with precocity will serve to call attention to the hormone effects of tumors and to the interesting information which a follow-up of cases may produce.

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ETIOLOGY OF PRE-ECLAMPTIC TOXÆMIA FROM A CLINICAL ASPECT[1]

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THE etiology of eclampsia has in the past been deeply veiled in mystery, and in all probability will remain so for a long time to come. Nevertheless reviewing what has been accomplished on the subject and deliberating as to what bearing the different theories have on one another, we find certain facts evident, namely, that in several of the theories advanced as to the cause of eclampsia, there is almost incontestable proof that each may have, in part, a definite bearing on the whole. With this in mind the author has formulated the following hypotheses which he attempts to prove from a clinical standpoint.

1. Undoubtedly there is a toxic substance or substances elaborated which give rise to the syndrome known as eclampsia.

2. This toxic substance is probably an early split product of the protein molecule.

3. The source of the toxin is not single.

4. There are three or more ports of entrance of the poison into the maternal circulation, namely: from autolysis of degenerating placenta, from absorption through the large intestine of split products of bacterial origin, and lastly from primary foci of infection.

5. The maternal circulation is so overwhelmed by these biproducts that its power to neutralize them is diminished and thus they produce injurious effects which result in the syndrome, eclampsia.

It is easy to see how Veit in 1901, when the placental theory was first considered, could believe that the presence of placental cells in the maternal circulation might lead to the formation of specific antibodies. Veit and Sholten (22), produced what they thought to be a serum which caused the disappearance of the nuclei in an emulsion of placental cells, and they, therefore, concluded that the toxic effect was due to an overabundance of placental cells.

Ascoli (2) prepared two varieties of sera, a heterosyncytiolysin and an isosyncytiolysin. There was less effect from the latter, and he concluded that the syncytiolysin was the toxic substance.

Weichardt (23) differs from them as to the manner of production of the poison. He says that placental cells plus blood equal syncytiolysin; that syncytiolysin plus placental cells equal syncytiotoxin; and that syncytiotoxin plus sufficient antibody equal no result, but that syncytiotoxin plus insufficient antibody equal eclampsia. He used finely-ground placental cells as the source of his endotoxin. Weichardt and Pilz (24) in 1906 immunized a rabbit with repeated small doses of syncytiolysin and emulsion of placenta against a large dose of endotoxin.

Liepmann (15) was unable to obtain cytolysis with specific sera but thought he found a precipitin.

Wormser (25) proved all these results inaccurate and showed them to be due to blood contained in the tissue used.

Pollak, in 1904 (20) and Aronson in 1905 both failed to detect syncytiolysis and precipitation with specific sera in a larger series of animals including rabbits, goats, and horses, than the others had used.

Frank (10) used another method—placental nucleo-protein that produced a more sharply specific reaction, and the deflection of complement, which had been proved more delicate than precipitin reaction. He also used rabbits' serum made lytic by hen's corpuscles. He also found the serum reaction due to the contained blood.

Labhardt (12) criticizes Ehrlich's side-chain theory promulgated by Veit. He says the very foundation of the theory does not seem sound, for the trophoblast is a product of a maternal cell and it is not logical to consider it foreign to the mother, and thus capable of producing antibodies and toxins. Furthermore, eclampsia is rare in the early months of pregnancy when syncytium is abundant and vice versa. Why does it not

[1] Read before the Chicago Gynecological Society, March 20, 1925. (For discussion, see p. 237.)

occur in extra-uterine pregnancy when abortion simulates the injection into the peritoneal cavity?

In 1900, and again in 1906, Weichardt and Pilz (24) experimented with the filtered extract of placenta. They claimed to obtain endotoxin both by mechanical action and cytolysis of the placental cells. After grinding and passing them through sieves and gauze they mixed in a definite amount of salt solution and claimed a "test toxin" which when injected intravenously in doses of 1 to 3 cubic centimeters produced death. Postmortem examination showed almost universal thrombosis. Smaller doses caused death by respiratory failure, and therefore they concluded that two toxic elements existed, one acting on the respiratory center and the other coagulating the blood.

Freund confirmed the above, but on trying to separate the two elements, found them non-toxic after passing them through a Berkefeld filter and concluded that the toxin was adherent to the cell particles. He obtained the same result with other glandular organs.

Lichtenstein (14) denies these results *in toto*. He ground the placenta to a graduated fineness and secured the following results: 2 cubic centimeters of emulsion (very fine) caused widespread thrombosis throughout the body. Two cubic centimeters was injected after passing through filter paper with no ill effect. In animals injected with emulsion filtered more finely, no effect was obtained. A suspension of agrilla (a fine clay) was made and the first injection was repeated with the same result. When filtered as in trial two and when trial three was tried, he obtained the same result. He concludes, therefore, that death is due to multiple emboli and denies the toxicity of the extract.

Englemann and Slade in 1909 (8) prepared an extract by using the Buchner press and after centrifuging and pipetting it off, a large series of injections were made. They confirm the results of Weichardt and Freund. They next used hirudin to inhibit the coagulation and obtaining negative results, concluded that the toxic effect was in coagulation only.

More recent works prove that nucleo-protein gives the same effect and that the toxicity is due to the nucleo-protein in the extract. Acconci and Botavi prepared nucleo-protein from the placenta and found coagulation of the blood the cause of death.

Dryfuss in 1908 (7) produced the "test toxin" of Weichardt and on injection got the same result. Then he got the same result with the precipitated nucleo-protein. An animal was then injected with "test toxin" from which the nucleo-protein had been precipitated, and no ill effect resulted.

Savare (21) took a solution of fibrinogen, freed from globulin, which failed to coagulate after standing several days. Placental extract was added and coagulation occurred in 3 hours at 37 degrees C. Blood containing placental tissue, caused coagulation in 30 minutes. He concluded that coagulation lay with placental blood instead of with cells.

Mohr and Freund (18) dried the placenta *in vacuo* at 30 degrees C. and extracted it with ether. They isolated a sodium oleate, a lipoid with hæmolytic properties. Human corpuscles were haemolyzed by .00025 gram. Maternal and fetal serum inhibited its action.

Liepmann, in 1905, began work with eclamptic placentas. He minced and dried the placentas *in vacuo* and then ground them into a fine powder (sifted sugar). One gram in salt solution was injected into the peritoneal cavity of a rabbit; 113 experiments were performed. The effect resembled eclampsia. Most of the rabbits died, and when death did not occur convulsive disturbances were present.

He also found that the toxin in the placentas of less severe cases of eclampsia was more toxic, and vice versa. The degree of severity was judged by the number of fits.

Frank and Dryfuss found no difference in the effect from eclamptic and non-eclamptic brains when injected into animals.

Bergell and Liepmann (3) were among the earliest investigators of the ferments of the placenta. They allowed placental extract to act on various substances and noted the resultant changes. Their findings were as follows: ferments acting on carbohydrate—diastase, lactase, and glycolytic ferment. Protiolytic ferments were very powerful. Lipolytic ferment was not demonstrated.

Controversy continued until 1907 when Savare eliminated all blood and found no invertase, tryosinase, aldehydose or glycolytic ferment, but found protiolytic ferments. He also found a blood coagulating ferment, a deamidizing ferment, and erepsin. He could not be sure that the deamidizing protiolytic ferment was not a postmortem change and he thought diastase and oxidase might be connected with metabolism of placental tissue.

As to the autolysis of the placenta, Mathes in 1901 (16) found abundant formation of albumose, leucine, and tryosin; Baso (1905) found the soluble nitrogen increased 100 per cent after 7 days' autolysis; Dryfuss in 1907 (7) made a thorough investigation of autolysis of eclamptic and non-eclamptic placentas with the following conclusions.

"Autolysis takes place during life in the eclamptic placentas. The process is more than a simple autolysis, since there is a relatively greater increase in the amide nitrogen compared to the total nitrogen. This shows that deamidizing ferment is more active than protiolytic." Then two possibilities arise: The placental state is either the cause of eclampsia or it is only an isolated phenomenon or effect of the disease.

The study of eclampsia by Young and Miller (26, 27) was carried out from two viewpoints, the clinico-anatomical, which concerned itself with a description and interpretation of the symptoms and morbid changes present, and the experimental, in which an attempt was made to reproduce these symptoms and morbid changes in lower animals.

From recent investigations into the cause of eclampsia has issued the belief that pregnancy is the cause and that the toxin produced originates from the placenta. Postpartum eclampsia is inconsistent with this view, but something of a chemical nature must have been left behind.

The following considerations that eclampsia and albuminuria of pregnancy are due to the liberation of products of the early autolysis of the placenta, are brought forward:

1. The toxæmias are especially associated with the recent infarction of the placenta.

2. Placental infarction is due to an interference with the maternal blood supply.

3. The interference with the blood supply which is responsible for the infarction is not dependent upon the toxic state, and, in point of fact, may occur in the most extreme form, when there is no evidence of a toxæmia, e.g., accidental hæmorrhage.

4. The placenta is so constructed that if a part of it die, the products liberated from the dying patch can pass directly into the blood stream. The cases of accidental hæmorrhage associated with a toxæmia are those in which part of the placenta remains attached for sometime after the separation of the adjacent part by a retroplacental bleeding. The necrosis liberates the toxic materials.

5. When the placental disease is gradual in its onset there is more chance of the evolution of the infarcted patches.

These facts all suggest that the toxæmias are due to the autolytic products liberated in the early stages of the placental death. By imitating the process *in utero* it has been possible to isolate from the healthy placenta a material or materials of a soluble kind which will reproduce the clinical features and the morbid changes especially characteristic of eclampsia. These are (a) convulsions, (b) peripheral focal necrosis of the liver, and (c) degenerative changes in the kidney. Postpartum eclampsia may be due to a small piece of retained placenta.

From the experimental reproduction of eclampsia in lower animals, Holland (11) draws the following conclusions:

1. The primary cause is to be sought in the placenta.

2. The "specific placental theory" of Veit must be considered no longer tenable; the various specific placenta reactions (syncytiolysis, precipitans, etc.) whether produced naturally or experimentally in animals do not exist.

3. Placental extracts possess no special toxicity for animals beyond causing coagulation of the blood and death from extensive thrombosis.

4. The eclamptic placenta has no special toxicity.

5. The activity of the intracellular ferments of the placenta are increased in eclampsia. (The most probable theory of the cause

of eclampsia is an intoxication of the body by the passage of ferments and autolytic products from the placenta into the circulation, the principal effect of which is an increased coagulability of the blood and the activation of autolytic ferments in other parts of the body.)

6. The conditions of the eclampsia are caused by placental degeneration due to interference with its blood supply.

7. Placental infarction is due to thrombosis or mechanical detachment of the placenta.

8. Absorption of the placental poisons occur only through the portions of the placenta attached to the uterine wall.

9. Toxæmia may be associated with placenta prævia and ablatio placentæ.

10. The major symptoms of eclampsia are due to absorption of the broken down liver cells and possibly other tissues which are killed by the placental poison.

To the theory that in the placenta lies the cause of the syndrome known as eclampsia, an especially notable contribution has been made by the Japanese worker, Isei Obata (19), who has carried out his work with two principal questions in mind:

1. Are the eclamptic placental extracts toxic?

2. Does the serum of eclamptic women possess the same ability to neutralize the toxins which the placenta may elaborate as that possessed by the serum of normal gravidæ?

In search of the answer to the first question, Obata took fresh specimens of placenta, made blood-free, ground and mixed them with three times their weight of normal salt solution and allowed them to stand at room temperature for half an hour. This mixture was then strained through silk and the resulting supernatant fluid was centrifuged, and thus freed from all particles.

Japanese dancing mice were used except in one or two instances when rabbits were substituted.

Injections of lethal doses of the extract caused clonic, rarely tonic, convulsions in 10 to 30 minutes, followed by dyspnœa, coma, and death in from 1 to 3 minutes. Even when death was postponed, the almost constant presence of the two symptoms, dyspnœa and convulsions, pointed strongly to a condition at least simulating eclampsia as seen in the human subject.

Observation was made that there seemed to be no relation between the size of the dose given and the body-weight of the animal.

The experiments were repeated with normal placental extract, and it was found that the dose required to produce the convulsions was very nearly the same as that required from the eclamptic material, being 0.025 to 0.10 cubic centimeter for the former and 0.019 to 0.1 cubic centimeter for the latter.

Injection of 0.3 cubic centimeter of fresh serum from men, normal gravidæ, and puerperal women caused symptoms differing from those caused by the eclamptic extract only in the slightly longer time elapsing before the onset of the symptoms.

Serum taken from eclamptic women both during and after an attack produced essentially the same syndrome.

From the above results, one might deduce that the placenta of eclamptic women is not, in itself, sufficiently toxic to produce eclampsia and that search must be made along other lines to find its real causative factors.

The second question under consideration had to do with the neutralizing power of the eclamptic serum as compared with that of the non-eclamptic women.

One cubic centimeter doses of eclamptic placental extract were mixed with fresh serum varying in amounts from 0.7 cubic centimeter to 0.025 cubic centimeter, normal saline being added to make each injection total 2 cubic centimeters. These were incubated 1 hour at 37 degrees C. Controls were used consisting of 1.0 cubic centimeter placental extract and 1.0 cubic centimeter normal saline.

It was found that the serum from men, pregnant and non-pregnant women possesses practically the same power to neutralize the eclamptic extract—0.2 to 0.3 cubic centimeter of these sera neutralizing 1 cubic centimeter of the placental extract of the eclamptic. However, it was found that the serum taken during an attack possessed this power to a

noticeably diminishing degree and that serum taken each day succeeding the attack showed a gradual increase in its neutralizing capacity reaching the normal on about the fourth or fifth day postpartum.

Therefore, it would seem that the serum of eclamptic women does show a marked deficiency in its ability to neutralize the toxins thrown into the system by the placenta but that this power is gradually restored postpartum.

In addition to the above observations it was noted that the serum of normal gravidæ possesses a neutralizing power which is no greater than that shown by non-pregnant women, thus proving that no immunological process can account for the neutralizing power present in the blood of the non-eclamptic gravida.

Postmortem examination of the animals used in the above experiments showed practically the same changes in the liver, kidneys, lungs, etc., as are found postmortem in the human subject. An exception to this is the apparent accelerated coagulation of the blood which points strongly to an intoxication.

The conclusions to be drawn from the work of Obata would be that:

1. The extract of eclamptic placentæ is not sufficiently toxic as compared with the normal as to justify the assumption that therein lies the cause of eclampsia.

2. The serum of eclamptic women is markedly deficient in its ability to neutralize the toxins elaborated by the placenta.

3. This deficiency is not caused by the convulsions.

4. The normal neutralizing power is restored by the fourth or fifth day postpartum.

It would seem, therefore, that from Obata's work, the statement might be made that "Eclampsia is an intoxication by placental poison made possible by a lowered capacity of neutralization on the part of the maternal blood."

Believing that the toxic agent in eclampsia is due to a large protein molecule, the result of autolysis, the author performed the following experiments:

A normal placenta was obtained in as aseptic a condition as possible and freed from maternal blood by repeated washing with sterile normal salt solution. Then the placental vessels were irrigated with sterile normal salt solution at 2 meters pressure for about 2 hours, rendering the placenta perfectly white and free from blood. To insure the tissue being free from contamination and blood, cubes were cut from the center, leaving both the fetal membranes and that portion which came in contact with the maternal structures behind. These cubes were next put into a sterile meat grinder and ground as finely as possible.

This finely divided mass was added to twice its volume of sterile normal salt solution and incubated for an hour, after which it was filtered through a fine silk screen. To the slightly turbid filtrate was added ½ per cent phenol, and the mixture was then sealed in sterile glass ampules which were kept in the refrigerator.

After standing, it was noted that each ampule contained a slight amount of white sediment and that the supernatant fluid was perfectly clear. In the experiments only the clear fluid was used.

Healthy non-pregnant guinea pigs were used in these experiments and the fluid was kept sterile and injected intraperitoneally.

Experiment 1. Pig No. 1 given 0.5 cubic centimeter of placental extract with no result. Pig No. 2 given 1 cubic centimeter of placental extract with no result. Pig No. 3 given 2 cubic centimeters of placental extract. In one minute pig became irritable.

Experiment 2. Pig No. 4 given 2 cubic centimeters of placental extract. In one minute pig became irritable. Given 2 cubic centimeters of placental extract, 15 minutes later. In three minutes pig developed chronic convulsions simulating eclampsia. This recurred at frequent intervals for 1 hour, with ultimate recovery.

Experiment 3. Pig No. 5. At 4:44 p.m., given 2 cubic centimeters placental extract. At 4:46 p.m., pig developed tremors with acute flushing of ears. At 4:49 p.m., there was incontinence of urine and fæces. At 4:55 p.m., pig given 1.5 cubic centimeters more. At 4:59 p.m., a repetition of convulsive movements.

Experiment 4. Pig No. 6. At 4:16 p.m., given 2 cubic centimeters placental extract. At 4:19 p.m., pig became restless and jumpy. At 4:26 p.m., pig apparently recovered. At 4:35 p.m., pig given 2 cubic centimeters more. At 4:36½ p.m., pig again jumpy. At 4:40 p.m., convulsive seizure. Labored respirations. At 4:44 p.m., much recovered; still twitching.

At 4:46 p.m., given 2 cubic centimeters more. At 4:50 p.m., severe convulsions, pig on its back, eyes fixed, abdomen distended. At 4:58 p.m., convulsions over; pig still irritable. Pig No. 7. Repetition of above experiment with same result. Pig No. 8. Repetition of above experiment with same result.

Experiment 5. Pig No. 9. Given 2 cubic centimeters pregnant horse globulin with no result. Given 2 cubic centimeters more on second day with no result. Given 2 cubic centimeters more on third day with no result. Given 2 cubic centimeters more on tenth day with no result.

Experiment 6. Two cubic centimeters of pregnant horse globulin was mixed with 6 cubic centimeters of placental extract and incubated for 1 hour. Pig No. 10. At 4:46 p.m., 2 cubic centimeters of this mixture was given. At 4:48 p.m., 2 cubic centimeters more given. At 4:52 p.m., very slight tremors noted. At 4:55 p.m., condition normal. Pig No. 11 At 4:46 p.m , 2 cubic centimeters of mixture was given. At 4:56 p.m., 2 cubic centimeters more given. At 5:00 p.m., 2 cubic centimeters more given with no reaction.

From the above experiments we may deduce the following facts:

1. By extracting with normal salt solution, placental tissues (free from blood) which have been incubated for an hour, we are able to obtain a substance toxic to guinea pigs when given in doses of 2 cubic centimeters or more, intraperitoneally.

2. This substance is quickly absorbed into the circulation of the guinea pig, and it seems to be soon neutralized.

3. If the extract be incubated with one-third its volume of pregnant horse serum (globulin) for 1 hour, its toxicity is destroyed.

The foregoing is at least rather striking evidence that there is a substance elaborated by autolysis in the normal placenta which in laboratory animals will give symptoms simulating eclampsia. But may not this be only one source of origin and may this toxic substance not be elaborated in other parts of the body as well?

Stroganoff believes in the bacterial theory of eclampsia and LaVake (13) in 13 cases of toxæmia and eclampsia found a primary infection in the teeth, tonsils, and sinuses. He also demonstrated the presence of streptococci, staphylococci, and colon bacilli, and emphasizes the fact that in eclamptic cases (1) there is a history of infection, (2) there are demonstrable foci of infection, (3) and that multiparæ having previous normal pregnancies and labors gave definite histories of symptoms of infections occurring since the last labor and especially during the pregnancy in which eclampsia occurred.

LaVake also agrees with Ross McPherson (17) that eclampsia may be due to intestinal stasis superimposed by colon bacillus and streptococcic infections.

Overeating and constipation may contribute to the predominance of a putrefactive type of organism in the large intestine resulting in putrefactive changes in the mucus present in the colon under these conditions.

Gibbon Fitzgibbon (9) brings out the fact clinically that there is a tendency in toxæmia cases toward overeating and constipation. It has also been noted by many German writers that during the war, when the protein consumption was low and the diet contained relatively more roughage, and the women were forced to greater activity, there was a great decrease in the number of eclamptic cases.

Davidson and Miller (6) in the Royal Maternity Hospital, Edinburgh, found that during the rationing period of the war the incidence of eclampsia diminished to two-fifths the usual number of cases, and believed that this was due principally to the decrease of protein in the diet at that time.

The author has reviewed the above etiological factors and has endeavored to bring out the fact that in all probability there is no immune reaction in eclampsia, but that there is a toxic substance or substances elaborated that are responsible for the end-results. From the above, the conclusion may also be drawn that the source of the toxic substances may be varied and it is the author's belief that the symptoms encountered are the result of an accumulative action and that the placenta is not the sole malefactor.

On a free protein diet, a putrefactive type of bacteria is developed which is capable of splitting the mucus formed in the large intestine into a toxic substance that may readily become absorbed in the circulation. Also certain noted writers, such as Stroganoff and Rossnau believe in a bacterial origin and call attention to focal infection and the presence of fever in these patients.

Now is it not conceivable that a sufficient number of toxic protein molecules may be thrown from various sources into the circulation to render the maternal organism unable to cope with any more, resulting in our conception of the toxæmia of pregnancy? And as evidence of this we have an increase of the uric acid content in the blood.

To determine the approximate frequency of eclampsia, the following statistics were compiled from the literature.

1. Ross McPherson (17) finds that in a series of 120,000 deliveries in the New York Lying-In Hospital, eclampsia occurred about once in every 185 cases, and his corrected mortality was 9.6 per cent or 104 deaths.

2. Between January, 1913, and December, 1922, 23,630 cases were admitted to the Glasgow Royal Maternity Hospital. Of this number Cruichshank (5) reports 814 cases of eclampsia, one in every 29 cases, or 3.6 per cent with a mortality of 22.4 per cent.

3. At the Sloane Hospital, New York City, in a series of 7,384 consecutive deliveries, Bunzel (4) found a toxæmia present 465 times with eclampsia in 54 cases, and a severe type of toxæmia in 141 others. This gave a ratio of one in about every 137 cases; 14 died giving 25 per cent primary mortality.

4. Albeck (1) found 16 eclamptics among 2,000 women confined or one in every 125 cases. He also observed that when the blood pressure was over 160 millimeters renal disease was always demonstrable; when between 150 and 160 millimeters, it was demonstrable in 47 per cent and when between 140 and 150 millimeters in 24 per cent of the cases.

It may now be computed that in 150,014 cases observed, eclampsia occurred once in every 178.2 cases or that we may expect to have at least one eclamptic in every 200 consecutive labors.

Before the author instituted a prenatal clinic at St. Luke's Hospital, there was an average of 6 to 8 eclamptics a year and in one period of 4 months, 14 cases were treated. Since the institution of the clinic with its supervision of patients, there have been confined 5,400 women with a mild eclampsia occurring three times, or an incidence of 1 in every 1,800 cases, and no mortality.

Next, 1,000 consecutive cases were analyzed, with the following results:

1. Blood pressure above 140-90 millimeters occurred in 176 cases.

2. Blood pressure above 160-90 millimeters occurred in 55 cases.

3. Of the 176 cases the initial increase in blood pressure occurred:

6 times during the sixth month of pregnancy.
9 times during the seventh month of pregnancy.
33 times during the eighth month of pregnancy.
127 times during the ninth month of pregnancy.

(This tends to bring out the assumption that toxæmia may develop as an accumulative effect.)

4. Ninety-six cases were primiparæ. Eighty cases were multiparæ.

5. Albumin was present 53 times antepartum.

6. Marked œdema was present 70 times antepartum.

7. Hyperacidity (urinary) present 148 times antepartum.

8. The average age for blood pressure 140–90 millimeters was 24.73 years and the average age for blood pressure 160-90 millimeters was 27.65 years.

9. Fifty-four hypertension cases occurred during the winter months. Thirty-nine hypertension cases occurred during the spring months. Fifty hypertension cases occurred during the summer months. Thirty-four hypertension cases occurred during the fall months.

(From this may be deduced that in all probability season has no marked influence on the incidence of eclampsia.)

10. In this group of 176 cases of hypertension the fetal mortality was 6.2 per cent which is about three times as great as that of the 824 cases remaining in this group of 1,000.

11. a. The highest blood pressure in this group was 216-130 millimeters which occurred in the ninth month of pregnancy during August, in a patient 30 years old. There was a marked œdema, and the urine became concentrated, highly acid, and contained albumin. Treatment was dietary, the baby delivered normally, and is living and well.

b. Another case, age 41, 1-para, reached 210 millimeters in November, the ninth month of pregnancy. There was a moderate amount

of œdema; urine contained albumin in moderate amounts and was highly acid. Result, still birth. Treatment: diet regulation, sweats, and administration of soda-bicarbonate.

c. A third case, age 27, had a blood pressure of 192-92 in October, the ninth month of pregnancy. There was no œdema and no albumin in the urine. She gave birth to a normal child. Treatment consisted in dietary measures and the taking of bromides.

d. A fourth case, age 34, reached 190-106 in October, the eighth month of pregnancy. There was œdema and hyperacid urine with albumin. Result, still birth. Treatment consisted in dietary measures.

12. a. Of the cases developing eclampsia one admitted being a heavy meat-eater. She developed a marked anasarca and for the active treatment, phletomy, morphine, and chloral were used. Her blood pressure was 170-104 millimeters and she had two convulsions.

b. A second patient entered the hospital with a blood pressure of 182-100 millimeters. She had a forceps delivery with only a slight muscular twitching while under anæsthesia.

c. The third patient on admittance ran a mild degree of fever, 101 degrees. There were no convulsions, but as they seemed imminent the blood pressure being 180-118 millimeters, a phlebotomy was done and labor induced. Two days after delivery, the blood pressure was 120-84 millimeters, recovery uneventful.

Two other cases of eclampsia have occurred on the service at St. Luke's Hospital within 5 years, but they were sent in from an outside source and were not seen until after delivery.

One patient was a large negress with a great generalized œdema, a blood pressure of 280-150 millimeters (as nearly as could be determined) and convulsions every 2 minutes. She was treated by phlebotomy, morphine, chloral, and alkaline glucose enemata. Recovery.

The other case was that of one of the attending staff. This woman gave birth prematurely to triplets and then had two convulsions, dying in the second attack.

The treatment advocated in all the cases of hypertension is essentially the same. The patient is advised to rest, elimination is increased and a salt-free, protein-free diet is given. Carbohydrates are pushed as well as buttermilk, in order to furnish easily assimilated food energy and to change the intestinal flora from a putrefactive to a fermentative type. (This is done for the following reasons: 15 minims of a filtered broth culture of diphtheria bacilli, when injected into a guinea pig, will kill the animal in a short time, while if 5 per cent glucose be added to the culture that is incubated for 24 hours, four times the amount of the filtrate when injected into the animal will have no untoward effect. This being true, a fermentative type of intestinal flora will probably produce less toxic material than the putrefactive type.) The patient is alkalinized with bicarbonate of soda and in some cases a calcium salt (such as calcium lactate or carbonate) is administered in large doses as it tends to increase the urinary output and to decrease the irritability of the nervous system and that of unstriated muscles. Phlebotomy is not practised unless eclampsia is imminent.

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DEPARTMENT OF TECHNIQUE

TANNIC ACID IN THE TREATMENT OF BURNS

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THE various phenomena associated with extensive burns have long engaged the attention of investigators in the fields of physiology, pathology, and clinical medicine. While as yet there has been presented no single theory which satisfactorily explains all of the observed changes following the primary burn, several more or less plausible theories have been advanced. Of these, three may be discussed briefly.

The reaction of the body to a burn strongly resembles the clinical state described by the term "toxæmia," which implies the presence in the circulation of some toxic agent. The more serious cases usually present early in the course a clinical picture commonly described by such terms as shock or exhaustion. There is a profound disturbance of the circulatory and of the heat regulating mechanisms and in all probability equally serious interference with many other functions of the body. MacLeod (24) states that the extent of the burned area is of more importance than the depth. He further writes as regards prognosis that a burn of even mild degree may cause a fatal issue and that this is almost inevitable in an adult if the area affected is more than one-third of the total body surface. This is in accord with the observations of Klauder (17). Authentic cases in children are recorded of burns of apparently slight severity, which have been followed by death. On the other hand patients with much more severe burns are known to have recovered and to have shown but a mild general reaction. There seems to be something especially harmful in a superficial burn.

The theories which have been evolved to explain these phenomena may be arranged roughly into the following groups: (1) Those in which interference with the normal functions of the skin is considered to be the essential factor in the causation of phenomena; (2) those in which the effects observed are attributed to changes in the blood resulting in altered function; and (3) those in which the picture is explained on the basis of absorption of a toxic substance in the blood stream.

THEORIES OF INTERFERENCE WITH NORMAL FUNCTION OF SKIN

A disturbance of one or another of the various functions of skin, namely respiration (13), excretion (9), temperature regulation (10, 19), and sensation (31), has been made the basis of theories explaining the clinical course which follows extensive burns. The data that have been presented in support of the theory that failure of the respiratory function of skin in mammals results in overwork of the viscera is entirely unconvincing. The theory of retention of normal excretory products of skin was shown to be untenable by the work of Kijanitzin (16), who demonstrated that the ill effect of gilding experimental animals is due to the abnormal biological conditions produced in the skin rather than to the retention of excretory products. He showed that gilding destroys the vitality of the area covered and that the microscopic picture is not unlike that seen in first degree burns. Welti (43) disproved the theory of failure of the heat regulating mechanism by showing that animals die in spite of adequate protection against such heat dissipation. Markusfeld and Steinhaus (25) discredited the theory based on the sensory function of the skin by demonstrating that interference with the nerve supply to a burned part in a rabbit's ear had no effect on the constitutional reaction, while division of the blood supply prevented it fairly effectively. This conclusion has been supported by the work of Kotzareff (18), who found that division of the nerves to the burned extremity in a guinea pig did not diminish the severity of the toxæmia.

THEORIES BASED ON ALTERATION OF THE BLOOD

It has been established that after burns concentration of blood takes place (2, 22, 29), the erythrocytes undergo certain morphological changes (34, 44), there is some loss of function of the red blood cells (14, 20), and thrombosis frequently takes place (44). In the opinion of Hoppe-Seyler

(15) the erythrocytes are not sufficiently altered either morphologically or functionally to ascribe serious trouble to such changes. He did not observe as much free hæmoglobin in the plasma as would be expected were the erythrocytes injured in great numbers. Robertson and Boyd (32) emphasize the fact that there is a greater increase of urea nitrogen than of total non-protein nitrogen. Underhill (39) believes that the increase of non-protein nitrogen and urea nitrogen is best explained on the basis of blood concentration.

THE TOXÆMIA THEORY

There is certain convincing evidence that suggests the formation at the site of the burn of a toxic substance, the absorption of which is responsible for the constitutional reaction. The first reported autopsies were those of William Cumin (6) published in 1823. In cases of early death the chief lesion found was hyperæmia of the thoracic and abdominal organs, while in instances in which death was delayed several days, there was observed a well marked inflammatory reaction. Bardeen (3), in a very admirable study of 5 fatal cases in children who ranged in age from 16 months to 8 years, and who died from 4 to 9 hours after being burned, observed degenerative changes in the liver, spleen, kidneys, and bone marrow. He further noted a general œdema of all lymphoid tissue, which was most marked at the germinal centers. The alterations observed were nearly identical to those found in lymph glands of children who die of an acute infection, like diphtheria, in which it is known that a toxin is present in the circulating blood. He concluded that the changes were of sufficient extent to make it unnecessary to assume a nervous factor as the cause of death and that the phenomena observed were best explained on the basis of an acute toxæmia. Weiskotten (42) and Olbrycht (27) from studies of autopsy material arrived at the same conclusion but emphasized the degenerative changes in the adrenals.

Reiss (30) succeeded in isolating from the urine of burned patients a substance toxic for animals which had many of the properties of pyridine. The finding of toxic agents in the urine has been confirmed by numerous investigators (1, 16, 23, 37), but there is no agreement as to the identity of the toxic substance present.

Vogt (41) and later Vaccarezza (40) observed that, when parabiosis was established between two animals and one was burned, the other showed evidence of toxæmia. The symptoms in the burned animal were observed to be less severe under such circumstances than when it was alone. It was further demonstrated that toxic symptoms did not develop in the unburned animal when it was separated from the burned animal within the first 12 hours, but both animals finally died of toxæmia when left united.

Pfeiffer (28) isolated cleavage products of protein decomposition from burned skin which were found to be neurotoxic and necrotoxic. These he described as being soluble in water, alcohol, and glycerol, and insoluble in chloroform and ether. Robertson and Boyd (32) have also demonstrated the toxicity of the products of protein autolysis in burned tissue. They concluded that the toxic material was composed of two elements; one which is thermolabile, non-diffusable and necrotoxic; the other is thermostabile, diffusable, and neurotoxic. They further showed that the toxin circulated in blood either in or was absorbed by the erythrocytes, because whole blood was found to carry the toxic principle, while blood serum was found poisonous only in enormous doses when given intraperitoneally to guinea pigs.

The clinical course which follows extensive superficial burns cannot be attributed to interference with any of the functions of the skin; nor can it be ascribed to the known changes of the blood. While these are doubtless contributing factors, they in themselves do not adequately explain the phenomena observed.

Of the various theories presented therefore, that which attributes the constitutional reaction to absorption of some toxic substance or substances from the burned area is most strongly supported by the available evidence.

The clinical and experimental facts suggest that the rational manner of combating the toxæmia would then lie in some form of local treatment, which would prevent the absorption of autolytic products of protein decomposition. This might be accomplished (1) by arresting the autolytic process; (2) by removing the products of decomposition mechanically or by baths; (3) by slowing the process of absorption by the use of vasoconstrictor drugs; and (4) by causing a local coagulation of all devitalized tissue.

There are data available which show that the rate of autolysis *in vitro* may be controlled by changing the hydrogen-ion concentration of the tissue. Wiener (45) found that the intracellular proteases act only in a faintly acid medium and that their activity is entirely checked by a slight shift to the alkaline side of the neutral point. There has been clinical application of this principle in the widespread use of sodium bicarbonate compresses and baths in the treatment of burns. This phase of the problem warrants further study.

There is a great deal of evidence in favor of removing as much of the devitalized tissue as possible in an effort to combat toxæmia. Vogt (41), Robertson and Boyd (32), and others have demmonstrated that early complete removal of the burned tissue will prevent the development of toxæmia. Brager (5) advised removing as much necrotic tissue as possible under general anæsthesia or large doses of morphine and then washing the bleeding surface with gasoline. Leiber (21) outlined a similar treatment. The use of these energetic measures is advocated after the primary period of collapse. There are borderline cases, however, in which the vitality of the patient might be taxed to such a degree by this therapy that a case with an otherwise favorable prognosis might conceivably end fatally. Further, the idea of administering a general anæsthetic cannot be accepted lightly in view of the fact that there is congestion of the lungs as well as of the abdominal viscera. A number of observers have attempted to obtain the same result by continuous baths, hoping to wash away the toxin or to dilute it so that the amount absorbed would be minimal. This is generally known as the Hebra method of treatment, although Rose (33) calls attention to the fact that Passavant was the one who introduced it.

Douglas (8) found, in studying a method for slowing the process of absorption in burns, that when the ear of a rabbit was abraded, strychnine sulphate applied to the surface was promptly absorbed and gave rise to typical strychnine convulsions. However, when the surface was first treated with procaine and epinephrin in a dilution up to 1:10,000, the rate of absorption was so diminished that convulsions did not occur. He applied this principle clinically in the treatment of burns, his aim being to release the toxic substance as slowly as possible so that the organism would not be overwhelmed by a single massive dose.

The fourth possible means of limiting absorption of the toxic material by coagulation or precipitation of the injured protein was suggested to the writer by the observation of Pfeiffer that the toxic extract from burned tissue is precipitated *in vitro* by bichloride of mercury in acid solution or by phosphotungstic acid. Bichloride of mercury has often been applied to burns to combat secondary infection. Fauntleroy (11) using a 1:5000 solution, arranged a method of continuous irrigation, while Ravogli (29) used a 1:2000 solution on compresses. In view of the fact that there is a large absorbing surface, this treatment is not without danger.

TANNIC ACID

While investigating the possibility of using phosphotungstic acid as a coagulant, the writer was advised by E. C. Mason of the similarity of tannic acid and phosphotungstic acid in regard to the property of precipitating protein. Tannic acid (7, 26, 38) is a non-nitrogenous amorphous powder which is readily soluble in water, glycerine, and alcohol, but insoluble in ether and chloroform. It precipitates proteins, alkaloids, some glucosides and the salts of the heavy metals. It forms a more or less stable compound with the protein constituents of the body fluids and cells. When applied to a burned surface in dilute solution, further penetration into the deeper lying protoplasm is apparently prevented by this action and the true astringent effect appears to be limited exclusively to the most superficial layers of tissue. Schuetz (35) has shown, however, that when first applied in concentrated solutions, the tannic acid may penetrate before superficial coagulation has occurred and in such an event a deep caustic action may result. The precipitated proteins in the surface treated provide a protective coating against chemical, bacterial, and mechanical action as well as against sensory and inflammatory irritation. When tannic acid comes in contact with blood in a test tube, it precipitates the protein; when administered intravenously, it acts similarly, portions of the precipitate forming small emboli. From this it may be concluded that the effects of tannic acid are limited to the point of application.

From the foregoing consideration of the properties of tannic acid, it is evident that it might be efficacious in precipitating the poisonous materials in burned tissue and thereby in preventing their absorption. It was with the idea of determining its value in this respect that the present investigation was undertaken.

It is noteworthy that picric acid, which has some properties in common with phosphotungstic acid and tannic acid, has been used extensively in the treatment of burns for its desiccant and analgesic action. The chief objections to its use have been the facts that its coagulant action is not marked in the concentrations used and toxic symptoms are not infrequently observed following its employment over extensive areas.

CASE REPORTS

CASE 1. No. 43382, J. M., a colored male, aged 27 years, was admitted to the hospital May 5, 1924, for treatment of burns received in a gas explosion. His temperature was 97.8 degrees, pulse 100, and respiration 24 to the minute. There was no evidence of collapse; the patient was in severe pain. There was a second degree burn of both hands,

forearms, and face. The upper arms and neck showed a first degree burn. Both ears as well as a number of small areas on the hands and forearms revealed third degree burns. Calculating the area involved according to the method of Berkow (4), 24 per cent of the total body surface was burned. There was a trace of albumin in the urine but no red blood cells. Results of blood studies are shown in Tables I and II.

The burns were dressed with compresses moistened with boric acid. Fluids were forced. The following day the rectal temperature rose to 101.6 degrees F. The dressings were found adherent to the raw areas which were covered with serum. The œdema of the face and arms was tremendous. The entire left arm and hand were placed in a compress moistened with a 5 per cent solution of tannic acid, the remaining burns were dressed as previously.

The burns were again dressed on May 7. The gauze on the right arm was attached at a number of places and was removed with some discomfort, exposing a surface covered with a large amount of serous exudate. Upon loosening the dressing on the left arm, it did not adhere at any point, nor was its removal painful. The surface was a dark brown color and was dry (Fig. 1). There was no exudate oozing from the surface. Œdema was definitely less than in the opposite arm. On palpation the surface felt like parchment paper and this procedure was not accompanied by any painful sensation. The patient was repeatedly questioned during the previous 24 hours about the relative comfort of the two arms and although the lesions were of the same severity, he always stated that the one moistened with tannic acid was the more comfortable.

The problem then arose as to the best method of separating the coagulated layer of exudate and devitalized tissue from the underlying uninjured tissues. The left arm was placed in a boric acid compress after first covering the denuded area with perforated cellosilk. The result with the tannic acid was so satisfactory that the right arm and hand were treated in this manner and the face was covered with a 5 per cent ointment of tannic acid made with vaseline and lanolin.

On May 8, the condition of the right arm appeared similar to that of the left on the preceding day. The face showed evidence of coagulation but the effect of the ointment was not as pronounced as that obtained by the compresses. A thin layer of coagulum could be removed from the surface with tissue forceps. This was gum-like and was composed of serum which had exuded. The destroyed epidermis did not show any drying effect like that seen on the arms. The left arm after being dressed in boric acid for 24 hours had changed in appearance. The surface was now moist. The coagulated epidermis peeled away in large sheets, exposing a healthy pink base. Over this fresh area a vaseline gauze dressing was applied. The right arm and face went through a similar process.

The rectal temperature rose daily to as high as 102 degrees F. until the thirteenth day when it began to fall toward normal. As soon as the healing of the face was well under way facial massage was begun. On June 6, a Reverdin skin graft was done on the hands and arms where the burn was of third degree. He was discharged on June 21, 1924, at which time the functional result in the fingers (Figs. 2 and 3) was quite satisfactory but the lower eyelids showed a developing bilateral ectropion.

CASE 2. No. 53761, A. L., a white male, aged 18 years, was admitted to the hospital on May 12, 1924, with a severe burn received from the ignition of gasoline spilled on the right arm. On admission he was in severe pain but his general condition was good. The temperature was 98.6 degrees, pulse 90, and respiration 20 to the minute. There was a second degree burn involving the right hand and entire arm extending up into the axilla and over the shoulder. There were numerous small areas which were denuded of epidermis and the underlying derma was chalk white and appeared devitalized. A quarter grain of morphine was given hypodermically and the arm was dressed in a compress moistened with 5 per cent tannic acid. When the effect of the morphine wore off, there was no recurrence of pain and it was not necessary to administer narcotics further. The following day the burned area was covered with a brown coagulum and the surface was dry. The body temperature was slightly elevated but the patient showed no toxic symptoms and chemical studies of the blood revealed no deviation from normal (Table I).

On May 14 the arm was placed in a wet boric compress in an effort to remove the coagulated tissue. The temperature rose within the next few hours to 102 degrees F., which was over a degree higher than its maximum the previous day. After the arm had been in boric acid for 24 hours, a weeping surface was presented when the dressing was changed. The coagulated tissue was swollen but still tightly adherent. The patient was discharged from the hospital against advice on May 15.

CASE 3. No. 43383, F. P., a white male, aged 34 years, was admitted to the hospital on May 5, 1924, for treatment of burns received in an illuminating gas explosion. When seen he was in acute pain but there was no evidence of exhaustion. His temperature by mouth was 98.8 degrees F., pulse 96, and respiration 20 to the minute. There was a second degree burn of the face, neck, right hand, and forearm (Figs. 4, 5, and 6). The urine was negative for albumin and sugar.

The burns were dressed with warm boric compresses. The patient's temperature varied from 99.4 to 102 degrees F. for the first 3 days after the accident.

On May 8, the œdema of the face was marked and the devitalized skin had begun to separate. There was a great deal of serum and exudate present. Five per cent tannic acid compresses were substituted for boric acid dressings. Around the eyes a 5 per cent tannic acid ointment was used. In 36 hours there was a very complete coagulation, and the tannic acid compresses were replaced by boric acid. The following day the patient became delirious, he tore his dressings away and only with difficulty was kept in bed. The delirium seemed out of proportion to the extent of the area involved. The patient became quiet on May 13, 1924, and at this time most of the sloughs had separated. His mental condition promptly cleared and he was discharged on May 29, at which time healing was complete except for several small crusts on the ears. (Summary of blood findings are given in Tables I and II.)

CASE 4. No. 45936, D. W., a white male, aged 26 years, was admitted to the hospital on June 15, 1924, for treatment of burns which resulted from falling into a tank of boiling water. His temperature was 99 degrees F., pulse 88, and respirations 20 to the minute. There was a second and third degree burn of both legs which began at the toes and extended upward and involved the perineum, scrotum, penis, and right flank. A small part of the anterior surface of the left thigh and lower leg showed a first degree burn. There was a second degree burn of the right hand and forearm. Of the entire body area, 44 per cent was involved.

The burns were covered with perforated cellosilk and a moist compress of 5 per cent tannic acid was placed over this. Three hours after the accident, the non-protein nitrogen of the blood was 42.2 milligrams per 100 cubic centimeters, the urea nitrogen 29 milligrams, blood sugar 161.3 milligrams and the uric acid 3.4 milligrams per 100 cubic centimeters.

The following day the burns had a brown color, there was no oozing from the surface which was quite dry. The pa-

tient's general condition was satisfactory. He was clear mentally and co-operated in taking fluids; there was no diarrhœa, the pulse was not rapid and was of good quality. The temperature was normal. The blood non-protein nitrogen had risen to 75 milligrams, the urea nitrogen to 24.8 milligrams, and the uric acid to 5 milligrams per 100 cubic centimeters.

Tannic acid compresses were continued until June 20. For the 4 preceding days the maximum temperature by mouth had been under 100 degrees F. Studies of the blood showed the various constituents had dropped to normal. The patient did not show any of the ordinary symptoms seen in the toxæmia of burns. He was rational and took fluids very well. The urine was negative for casts, albumin, and red blood cells. The burns were now covered with a firm layer of leatherlike coagulated material. Tannic acid was discontinued and the compresses were saturated with boric acid solution, in an effort to remove the precipitated protein. Within 12 hours the temperature rose to 101.6 degrees F. The following day, hiccough began and the lesions showed the precipitated layer to be quite thick, soft, and boggy.

On the morning of June 22, the patient became irrational, vomiting became incessant, and the pulse was rapid and thready. The burns presented a weeping oozing surface covered with macerated sloughs. Pressure on these sloughs caused serum to pour out. The dressings were changed back to tannic acid in an effort to stop absorption. Although the kidneys continued to function and the urine remained negative for albumin and blood, the non-protein nitrogen of fasting blood specimen had risen from normal to 75 milligrams; the urea nitrogen was 37.4 milligrams; sugar 133.3, and the uric acid was 4.21 milligrams per 100 cubic centimeters. The toxic symptoms continued, the pulse became more rapid, the temperature gradually fell and death occurred on June 23, the ninth day after the accident.

In Case 2, when boric acid was substituted for tannic acid in an effort to remove the coagulated tissue, there was a prompt and marked rise of temperature. The extent of the burn was not sufficient to give very severe constitutional symptoms. In Case 3, the use of boric acid after precipitating the devitalized skin was immediately followed by a delirium and a pronounced rise of the non-protein nitrogen of the blood. In Case 4, the maceration attendant upon the use of the boric acid solution on the dead tissue was accomplished by a complete change in the clinical picture. A patient, who had shown none of the usual toxæmic symptoms promptly developed into the characteristic picture and the case ended fatally. The nitrogenous constituents of the blood had returned to normal level and then showed a remarkable rise with this change of therapy (Fig. 7). From these observations, it appeared that using boric acid to soften the precipitated protein material to hasten its separation was definitely associated with the development of more severe toxic symptoms. This was evidenced by an elevation of temperature, nausea, vomiting, tachycardia, rise in the blood non-protein nitrogen and delirium. In 1 case, in which the prognosis appeared favorable, death ensued. The burns which, while under tannic acid therapy were dry and clean, were converted into sloughing boggy surfaces covered with exudate. It appears that when the colloids holding the toxic substances were rehydrated, they were again made available for absorption.

Case 5. No. 43385, W. G., a colored male, aged 48 years, was admitted to the hospital on May 5, 1924, for treatment of burns received in an explosion of illuminating gas. On admission he was not suffering severe pain. His temperature was 98 degrees F., pulse 68, and respiration 22 to the minute. There was a second degree burn of the face, neck, left arm, and hand. The ears and dorsum of the wrist showed a third degree burn. The urine contained glucose but no albumin. Blood studies as recorded in Tables I and II showed no change from normal.

The burns were covered with vaseline gauze and fluids were forced by mouth and rectum. The day following admission to the hospital the rectal temperature was 103.4 degrees F., but there was no other evidence of toxæmia. On May 8, the burns presented a macerated surface from which serum oozed. The hand and arm were dressed with 5 per cent tannic acid solution, the face and neck were treated in a similar manner except around the eyes where a 5 per cent tannic acid ointment was used. The next day the burns revealed a brown, dry, parchment-like surface from which the dressing readily separated without any bleeding. The ointment had caused some coagulation but this was not as pronounced as on the areas treated with the compresses. This therapy was continued for 48 hours and then the burns were covered with paraffine gauze, over which boric compresses were applied for 24 hours. The burns were then exposed to air, which caused drying of the lesions and improved their appearance. The temperature reached normal on the twenty-third day. On June 5, the posterior auricular regions were skin grafted and on June 21, the ears were skin grafted. Massage of the face was begun as soon as the new epithelium permitted. He was discharged on July 9.

Case 6. No. 43386, J. B., a white male, aged 43 years, was admitted to the hospital on May 5, 1924, for treatment of burns received in an explosion of illuminating gas. His temperature was 97 degrees F., pulse 88, and respiration 22 to the minute. There was a second degree burn of the entire face (Figs. 8, 9, and 10), neck, scalp, and posterior aspect of each shoulder. There were third degree burns of each ear and of the adjacent skin. The urine was negative for albumin and glucose. Results of blood examinations are shown in Tables I and II.

The burns were dressed with boric acid compresses. Fluids were forced by mouth and rectum. The following day the rectal temperature was 103.2 degrees F. On May 8, 1924, the face presented an œdematous sloughing mass of necrotic tissue. Five per cent tannic acid compresses were applied to the burned areas instead of boric acid. The temperature, which previously had ranged above 103 degrees F., now fell to 101 degrees F., on May 9. The surface was covered with a light brown coagulum which could be lifted away. The tannic acid was continued for a total of 48 hours before a satisfactory coagulation occurred. On May 11, the burns were dressed with boric acid compresses and after 24 hours, were exposed to air. No further dressings were applied. After the epidermis dried, it readily separated, leaving a healthy surface beneath. Gentle facial massage was begun on May 22, and the patient was discharged on May 29, at which time healing was complete except for a few minor lesions about the ears.

Fig. 1. Case 1. Second degree burn of both hands and forearms. Right, dressed with boric acid compresses for 48 hours, shows macerated surface. Left, dressed with 5 per cent tannic acid solution for 24 hours, shows dry smooth homogeneous surface covered with a natural protective layer of coagulated exudate and devitalized tissue.

In Cases 5 and 6, when the tannic acid treatment was followed with compresses of boric acid, the tissues became macerated and a weeping surface appeared. However, on exposure to air the devitalized epidermis promptly dried and within a few days separated as large dark scales from a surface which was covered with new soft pink epithelium.

Case 7. No. 43427, J. B., a white male, aged 45 years, was admitted to the hospital on May 5, 1924, for treatment of burns received in an explosion of illuminating gas. His temperature was 98 degrees F., pulse 82, and respiration 20 to the minute. There were second degree burns involving the entire face, neck, both hands, and forearms. The urine showed glucose present but otherwise was negative. (For detailed blood studies see Tables I and II.)

Fluids were forced. The arms and hands were dressed with vaseline gauze and vaseline was applied to the face and neck but no dressing was placed over this. On May 10, the burns were covered with necrotic epithelium, which was beginning to separate. There was much exudate present. The urine became glucose free after the first specimen. The vaseline gauze dressings were discontinued on the arms and 5 per cent tannic acid compresses substituted. The following day, May 11, the arms were quite dry, there was no exudate present. The compresses were continued for a total of 48 hours and at this time the burned surface had become a light brown color and was clean. Vaseline gauze again was used for a dressing.

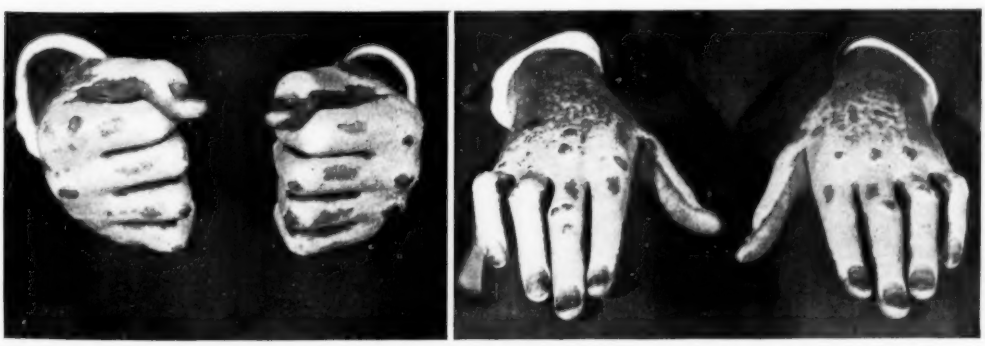
The temperature varied from normal to 101.4 degrees F., until the ninth day and after that did not become elevated. The patient was discharged on May 29, 1924, at which time all the burns were healed except a few small areas on the left arm.

Case 8. No. 44327, B. S., a white male, age 26 years, was admitted to the hospital on May 23, 1924, for treatment of burns. He had been working near a kettle of boiling oil which upset and splashed over his face and clothing. His temperature was 97 degrees F., the pulse 72, and respiration 18 to the minute. There were multiple second degree burns of the face, forehead, chest, back, and forearms which measured from 1 to 2.5 centimeters in diameter.

The burns were covered with compresses saturated with 5 per cent tannic acid. The following day a satisfactory coagulation had been obtained and the burns had become insensitive. They were then dressed with vaseline gauze. No symptoms of toxæmia developed. Healing occurred promptly and the patient was discharged on the tenth day following the accident.

Case 9. No. 43425, A. B. C., a white male, aged 32 years, was admitted to the hospital on May 5, 1924, for treatment of burns which resulted from an explosion of a gas oven. On arrival at the hospital his condition was good, temperature was 98.8 degrees F., pulse 72, and respiration 20 to the minute. There were second degree burns involving both hands, forearms, upper arms, upper back and shoulders, neck and face. About 25 per cent of the total body area was burned. Urine was negative for sugar and albumin.

The burns were dressed with vaseline gauze. Fluids were forced. The pain was so severe that morphine was necessary at frequent intervals. On May 10, the burns were



Figs. 2 and 3. Case 1. Photographs taken on the forty-seventh day. Healing complete. Very slight limitation of motion. No evidence of normal pigment deposit.

Fig. 4.

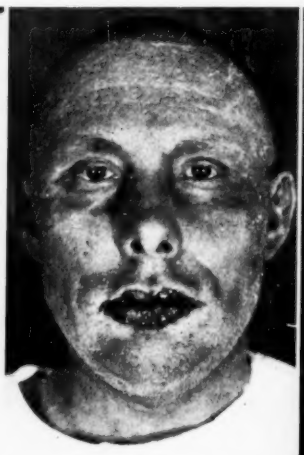


Fig. 5.

Fig. 6.

Fig. 4. Case 3. Second degree burn. Photograph taken 12 hours after accident.

Fig. 5. Case 3. Photograph taken on thirty-third day.

Fig. 6. Case 3. Photograph taken 7 months after burn. No scars, no contractures of eyelids are present, and the mouth is normal.

covered with sloughing epithelium, there was a great deal of exudate present. The rectal temperature varied from 102.6 to 103 degrees F. The burns were then dressed with 5 per cent tannic acid compresses. Twenty-four hours later examination of the lesions showed them to be quite dry. The devitalized tissue was a light brown color, and there was no exudate present. Coagulation seemed adequate and the burns were again dressed with vaseline gauze. The temperature remained normal after the thirteenth day. The patient was discharged on May 30, the twenty-sixth day after the accident.

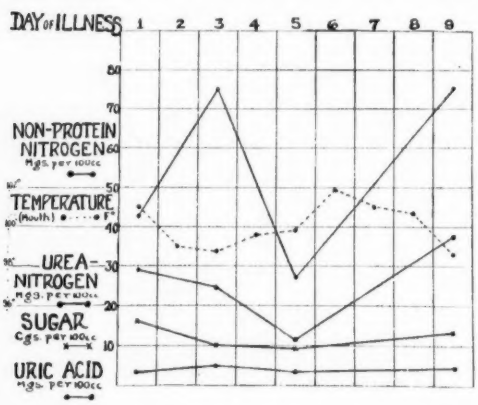


Fig. 7. Case 4. Showing very slight elevation of temperature and return to normal limits of non-protein nitrogen and urea nitrogen on the fifth day. Burn involved 42 per cent of the total body surface. Prompt elevation of temperature on the sixth day following use of boric acid compresses on the precipitated layer: subsequent elevation of non-protein nitrogen and urea nitrogen.

In Cases 7, 8, and 9, tannic acid precipitation was followed by the application of vaseline gauze. The extreme maceration like that seen after the use of boric acid was not seen, nor did symptoms of toxæmia develop. Although the application of vaseline to the coagulated tissue softened it, there was nothing observed to suggest that it hastened separation of the devitalized tissue.

Case 10. No. 44106, H. D., white male, aged 43 years, was admitted to the hospital on May 20, 1924, for treatment of a chemical burn. His scrotum had been chafed and mistaking corrosive sublimate for boric acid powder, he rubbed it thoroughly into the skin. On arrival at the hospital he was in severe pain. Although seen within an hour after the accident, blebs had formed over the entire scrotum and œdema was well marked. A compress saturated with 5 per cent tannic acid was applied. This gave complete relief from pain in about 15 minutes. The following day the skin was a dark brown color. The blebs had dried and the epidermis stripped off in small dry flakes. The scrotum was then exposed to air. This was not followed by the appearance of any moisture. On May 23, 1924, a dusting powder of stearate of zinc was used and the patient was discharged.

Case 11. No. 44384. T. P., a white male, aged 43 years, was admitted to the hospital on May 5, 1924, for treatment of burns received in an explosion of illuminating gas. His temperature was 98.7 degrees F., pulse 90 and

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 8. Case 6. Photograph, taken 18 hours after the burn, shows second degree burn of face and third degree burn of right ear.

Fig. 9. Case 6. Photograph taken on thirty-third day. Healing of second degree burns complete. Third degree burn of ear granulating.

Fig. 10. Case 6. Photograph taken 7 months after burn, showing condition of ear and face.

respiration 22 to the minute. There was a second degree burn of the entire face and scalp which was not protected by hair. The neck showed a second degree burn, while the ears were burned to the third degree. See Figs. 11, 12, and 13. (Blood findings are shown in Tables I and II).

The entire head was placed in a compress saturated with boric acid. Fluids were forced by mouth and this was supplemented by 300 cubic centimeters of tap water given per rectum every 3 hours. During the next 48 hours the maximal rectal temperature was 102.4 degrees F., on May 8, the sloughs were beginning to separate and the face and head were covered with serous exudate. A 5 per cent tannic acid solution was substituted for the boric acid. Around the eyes a 5 per cent ointment of tannic acid was used. On May 9, a satisfactory coagulation had occurred and the lesions were then exposed to the air. The surface remained dry and gradually large scales of epidermis separated. The temperature remained normal after the ninth day. Gentle facial massage was begun on May 16. The patient was discharged on June 6, and at this time the skin of the face was loose but still quite red.

Case 12. No. 46944, J. A., a white male, aged 32 years, was admitted to the hospital on July 9, 1924, for treatment of burns received in a gasoline explosion. His temperature was 98.8 degrees F., pulse 82, and respiration 20 to the minute. He was in severe pain. There was a second degree burn of the left hand and entire forearm. There was a second degree burn of the right hand extending upward, involving the forearm to the juncture of the middle and upper thirds. There was a second degree burn of the chin and right ear and a first degree burn of the neck and remainder of the face. The urine was negative for glucose and albumin.

A protective layer of vaseline was placed on the face. The hands and arms were dressed with a compress moistened with 5 per cent tannic acid. The following day the hands and arms were dry and clean. The skin was a light brown color. The surface was insensitive on palpation. The burns were then exposed to air and no moisture developed. The dried devitalized epidermis gradually peeled away. The temperature remained normal during the entire period of hospitalization. He was discharged on July 16, at which time healing was practically complete.

Case 13. No. 40131, M. V., a white female, aged 42 years, was admitted to the hospital on May 11, 1924, for treatment of a burn. The patient had previously been under observation for a hysterical hemiplegia. Her husband prepared a bath and lifted her into it. On admission a few hours after the accident her temperature was 102 degrees F., pulse 108, and respiration 22 to the minute. There was a second degree burn of the entire buttocks, low back, and posterior aspect of both thighs. Urine was negative for albumin and sugar.

The burns were dressed with a compress saturated with a 5 per cent tannic acid solution. After 24 hours the surface was dry and where the blebs had broken the surface was a brown color, while the devitalized epidermis was a lighter shade of brown. The burns were then exposed to air. The temperature reached normal on the eleventh day. Healing was prompt and the patient was discharged on May 24, 1924, at which time only a few small areas remained open.

Case 14. No. 46945, B. C., a white male, aged 57 years, was admitted to the hospital on July 9, 1924, for treatment of burns received from caustic soda which splashed on the patient's upper right arm and neck. His temperature was 98 degrees F., pulse, 90, and respiration was 18 to the minute. There was a second degree burn of the entire upper third of the right arm extending around to the axilla. There was also a second degree burn of the lower third of the upper arm, extending over the elbow and involving the upper third of the forearm, with small burns on the neck.

Fig. 11.

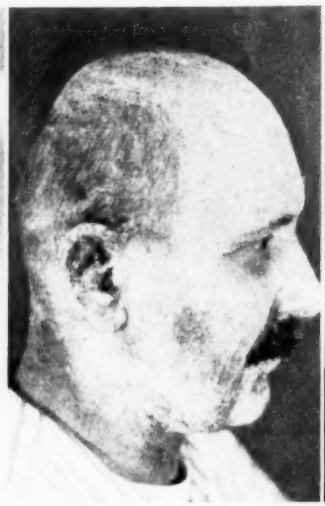


Fig. 12.

Fig. 13

Fig. 11. Case 11. Photograph taken 18 hours after accident showing second degree burn of entire face and scalp, third degree burn of ear.

Fig. 12. Case 11. Photograph taken on thirty-third day. Healing of second degree burn complete, but normal pigmentation still absent. Third degree burn of ear granulating.

Fig. 13. Case 11. Photograph 4 months after burn. Eyelids normal. No contracture, no scar.

A gauze compress was immediately applied which was saturated with 5 per cent tannic acid solution. There was prompt relief from pain and no sedative was necessary for sleep. On July 10, the dressing was removed without causing any discomfort, but only a partial coagulation had been obtained. A 2.5 per cent solution of tannic acid was then used. On July 11, the concentration was diminished to 1 per cent and this was continued until July 15, at which time healing was well under way and most of the devitalized epidermis had separated. The burns were then exposed

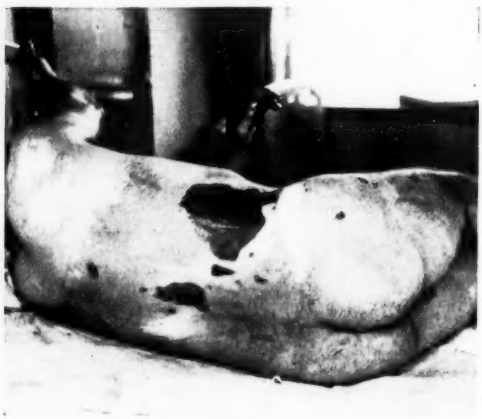


Fig. 14. Case 15. The black areas are second degree burns. At the waist there is a white band of unburned skin where the patient's belt held his clothes tightly against his body. There is a similar white area of unburned skin at the angle of the right scapula. The remainder of the skin of the back which is slightly darker and extends down to the knees, is a first degree burn. Forty-eight per cent of the total body surface burned.

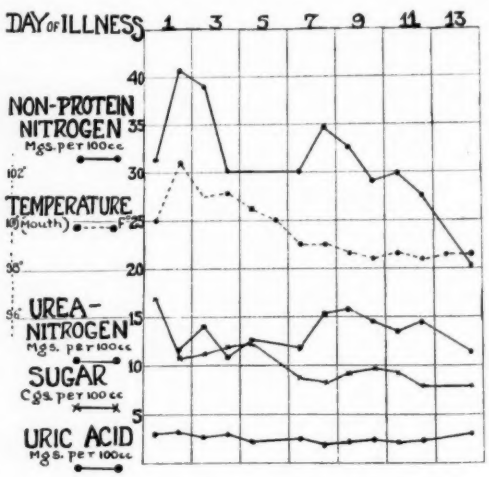


Fig. 15. Case 15. The blood non-protein nitrogen and urea nitrogen remained practically within normal limits. Burns involved 48 per cent of the total body surface.

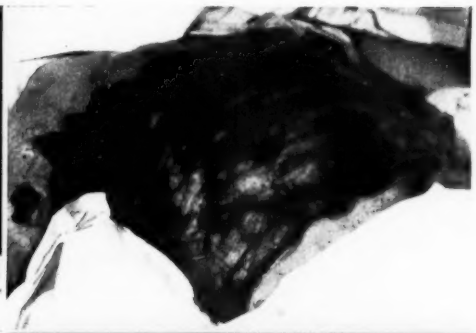


Fig. 16 (left, above). Case 16. Second degree burn of back, showing marked coagulating action of tannic acid solution.

Fig. 17 (left, below). Case 16. Second degree burn of the hands, and a third degree burn of the elbow and the upper arm.

Fig. 18 (right, above). Case 16. Second degree burn of chest and abdomen.

Fig. 19. Case 16. The coagulated layer over the second degree burn has separated and the edges have been trimmed away, exposing a dry intact epithelial surface. Photograph taken on sixteenth day.

to air during the day and at night were protected with vaseline gauze. During the entire period of hospitalization the temperature remained normal. The patient was discharged on July 20, and at no time did the non-protein nitrogen, urea nitrogen, or uric acid rise above normal.

Case 15. No. 48100, A. McC., a white male, aged 49 years, was admitted to the hospital on August 8, 1924, for treatment of burns, which resulted from falling into a tank of boiling water. A dressing saturated with boric acid solution had previously been applied. The patient was in collapse. The temperature was 96.4 degrees F., pulse 72, and quite compressible, and the respiration was 18 to the minute. The skin was cold and covered with a profuse sweat. The expression was anxious, the pain was not severe. He was placed in a warm bed and surrounded with hot water bottles. A quarter grain of morphine was given and 500 cubic centimeters of 5 per cent glucose was administered intravenously. The dressings previously applied were saturated with a 2.5 per cent solution of tannic acid. He was quite nauseated and vomited occasionally.

After the primary period of depression, the temperature rose to 100 degrees F. The dressing was changed about 5 hours after admission. There were second degree burns of the left axilla, upper left arm, left hip, right flank, and several smaller areas over the back. The remainder of the left arm and hand showed a first degree burn. There was a first degree burn starting just above the nipples, extending downward over the entire abdomen and thighs, to the

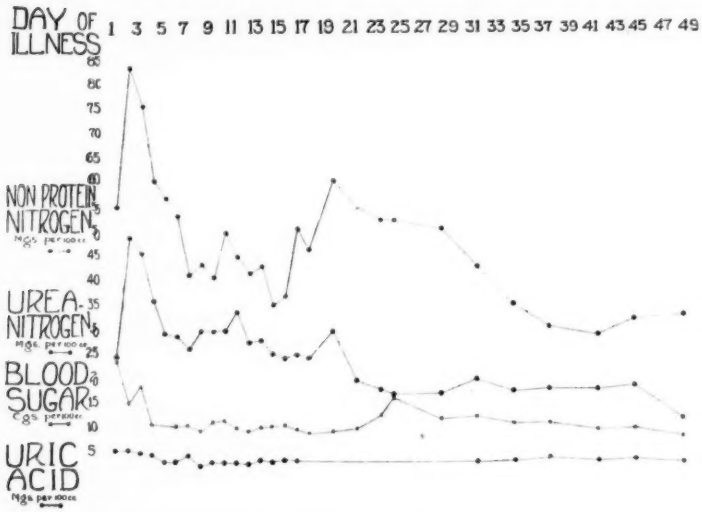

DAY OF ILLNESS
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49
NON PROTEIN NITROGEN
UREA-NITROGEN
BLOOD SUGAR
URIC ACID

Fig. 20. Case 16. The blood non-protein nitrogen and urea nitrogen rose promptly after the burn and gradually returned to normal limits. The blood sugar was 208.1 milligrams per 100 cubic centimeters during the period of "shock" and then fell to normal level. During the later period, when the arms and legs were dressed with boric acid solution and subsequently with Dakin's solution, there was a rise of non-protein nitrogen.

knees. Posteriorly, the first degree burn began at the middle of the scapula extending downward over the buttocks and thighs to the knees. The only uninvolved skin of this area described, was a white line around the waist where the patient's belt had held his clothes tightly against his body. By actual measurement, 48 per cent of the total surface was burned (Fig. 14). The urine contained glucose but was negative for erythrocytes and albumin (Fig. 15). For blood studies see Tables I and II.

Fluids were forced to 10,000 cubic centimeters daily. Three hundred cubic centimeters of a 5 per cent solution of glucose in normal saline were given every 3 hours per rectum. The burns were dressed after they were covered with a layer of perforated cellosilk over which a gauze compress was placed. This was kept moistened with a 2.5 per cent solution of tannic acid. The temperature rose to 102.4 degrees F., the day after the accident and then gradually became lower remaining normal after the seventh day.

On August 12, the skin which showed first degree burns began to exfoliate. Many of the areas originally considered first degree burns proved to be second degree burns. The later areas were of a characteristic brown color. The wet dressings were discontinued. A large crib was placed over the bed and the patient was exposed to the air. Difficulty was experienced in keeping him warm until electric light bulbs were placed under the crib. The second degree burns remained dry and healthy. On August 18, the second degree burns were dressed with vaseline gauze so that the crib could be dispensed with and trauma of these areas be prevented. The patient was permitted to sit up on August 21, 1924, and 4 days later was discharged, the twentieth day after the accident.

Case 16. No. 48123, R. N., a white male, aged 42 years, was admitted to the hospital on August 5, 1924, for treatment of burns received in a gasoline explosion.

Practically all of his clothes had been removed previous to his arrival at the hospital. When seen he was having a chill. The temperature, per rectum, was 97.6 degrees F., the pulse rate was 104 to the minute and it was weak and irregular in force and rhythm. The respiratory rate was 26 to the minute. The skin was blanched and cold, and the face was moist with perspiration. He vomited frequently. There was a second degree burn beginning in the left nipple line extending across the chest, through the right mid-axillary line reaching posteriorly almost to the midline. There was a second degree burn of the lateral aspect of the left forearm, the remainder of the arm extending from the tips of the fingers to above the elbow showed a first degree burn. There was a second degree burn of the right hand, forearm, and upper arm. The inner aspect of the right upper arm, and the axilla showed a third degree burn. Anteriorly the burn extended from just below the clavicles to the suprapubic region, while posteriorly it extended from the spine of the scapula to below the crest of the ilium. There was a second degree burn of the inner aspects of the upper third of the thighs, which extended up to the perineum. This was surrounded by a first degree burn which involved the remainder of the upper half of both thighs. There was a second degree burn of the scrotum and a third degree burn of the penis. The total of the burned area was 42 per cent of the entire body surface. (See Figs. 16, 17, 18, and 19.)

The patient was given a quarter grain of morphine, and the entire burned area was rapidly covered with cellosilk over which was placed a compress moistened with 2.5 per cent tannic acid solution. He was surrounded with hot water bottles and covered with a number of blankets. Three hours later he was given a transfusion of 750 cubic centimeters of citrated blood. After this the symptoms improved.

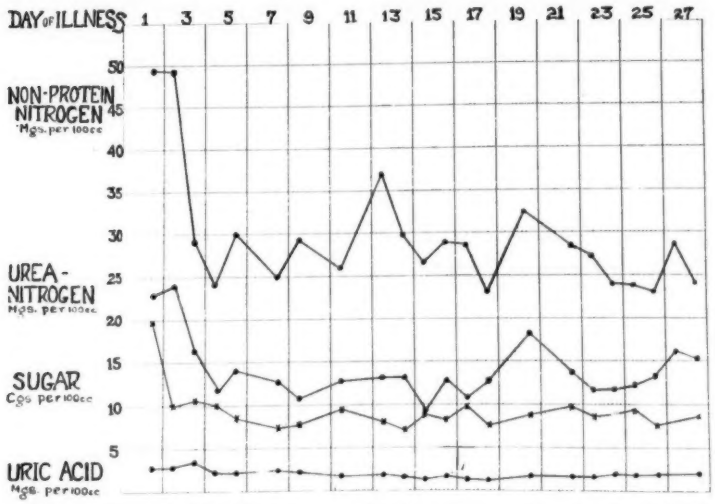

DAY OF ILLNESS
1 3 5 7 9 11 13 15 17 19 21 23 25 27
NON-PROTEIN NITROGEN
Mgs. per 100cc
50 45 40 35 30 25 20 15 10 5
UREA-NITROGEN
Mgs. per 100cc
SUGAR
Cgs per 100cc
URIC ACID
Mgs. per 100cc

Fig. 21. Case 18. The blood non-protein nitrogen, urea nitrogen, uric acid and sugar remained within normal limits after the first 24 hours. Burns involved 47 per cent of the total body surface.

The following day upon removing the dressing, a satisfactory coagulation was observed. The burns presented a light brown, dry homogeneous surface. The patient continued to vomit and the rectal temperature rose to a maximum of 102 degrees F. The concentration of the tannic acid solution was reduced to 1 per cent. On August 7, the chest was exposed to air. The 1 per cent tannic acid was continued on the arms until August 12, at which time they also were exposed to air. On August 13, the left arm was placed in a boric acid compress. There was no exacerbation of symptoms and on August 15, the right arm was placed in a similar compress in an effort to hasten separation of the sloughs. During this period the non-protein nitrogen again rose (see Fig. 20). On account of the thickness of the sloughs over the third degree burns, Dakin's solution was substituted 2 days later. This was continued until August 29, when a pinch graft was done.

The extensive burn over the chest was not disturbed after being exposed to air. In about 8 days, the edges began to loosen and curl upward. Each day this was trimmed away but no effort was made to free any additional coagulated material. This process was so slow that when the curled up edges were removed a surface was exposed which was already covered (Fig. 19) with epithelium which had grown underneath. The patient was discharged on October 7, the sixty-third day after the accident, at which time healing was complete.

Case 17. No. 50856, M. K., a white boy, aged 8 years, was admitted to the hospital on October 9, 1924, for treatment of burns received from igniting a can of flashlight powder. The child was in severe pain. His temperature was 98.6 degrees F., pulse 110, and respiration 24 to the minute. There was a second degree burn of the entire face and of both hands and forearms. Urine examination showed neither albumin nor sugar present. The face was covered with a 5 per cent ointment of tannic acid and the hands were placed in a 5 per cent tannic acid compress. No dressing was used over the face. Fluids were forced to 3000 cubic centimeters daily. Twelve hours after the accident the temperature rose to 101 degree F., and then gradually fell to normal. The compresses were continued on the hands for 18 hours. At this time the burned skin was a light brown and the epidermis over the blebs which had previously been punctured was dry and wrinkled. The hands were then exposed to air and no further dressings were used. The ointment on the face was discontinued at the same time. The lesions were dry and remained so. The child was discharged from the hospital on October 15, at which time the face and hands were still covered with adherent, dry, devitalized epidermis. There were still a few crusts around the lips. At no time did any evidence of toxæmia develop.

Case 18. No. 47448, M. T., a white male aged 37 years, was admitted to the hospital on July 21, 1924, for treatment of burns resulting from falling into a tank of boiling water. The patient was in severe pain. His temperature was 98.8 degrees F., pulse 90 and respirations were 18 to the minute. There was a second degree burn of the left leg involving the buttock, entire thigh and knee. From the knee to the ankle there was a continuous third degree burn. The entire left foot showed a second degree burn. On the right side there was a second degree burn of the foot. From the ankles to the knee there was a continuous third degree burn. The inner aspect of the right thigh showed a second degree burn while the lateral surface was burned to the first degree. There were second degree burns of the flexor surfaces of both forearms while the remainder of the forearms and hands showed first degree burns. By actual measurement, 11 per cent of the total body surface was burned to the third degree, 13 per cent to the second degree, and 23 per cent to the first degree, making a total of 47 per cent of the surface area (Fig. 21). The urine contained sugar but no albumen. (Results of blood studies are shown in Tables I and II.)

The entire burned area was dressed with compresses kept moist with 5 per cent tannic acid. Fluids were forced to 10,000 cubic centimeters daily, most of which was taken by mouth. The day after admission the patient vomited a few

Fig. 22. Case 18. Photograph taken on the fourteenth day showing a third degree burn. The blackened edges have separated and been trimmed away exposing a granulating surface.

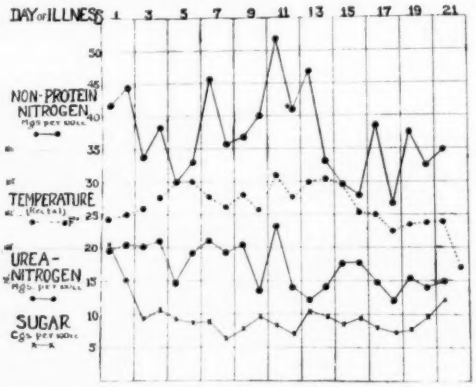


Fig. 23. Case 21. Chemical constituents of blood and temperature curve during period of treatment. Fifty-three per cent of total body surface burned. Retention of nitrogenous substances not remarkable. Elevation of sugar striking only during period of "shock."

times, but this was believed to be due to forcing fluids by mouth too vigorously as there were no symptoms of toxæmia. The temperature rose to a maximum of 102.6 degrees F. The burns were a light brown color and dry. The dressings did not adhere and were removed without causing any pain. The burns were covered with perforated cellosilk and a compress was placed over this and moistened with tannic acid. When the burns were dressed on July 23, the color of the precipitated layer continued to become darker and the concentration of the tannic acid was further reduced to 1.5 per cent and on July 26, this was further reduced to .75 per cent. Two days later the edges of the coagulated layer began to separate. The legs were then exposed to air constantly. Each day the loose edges were trimmed away (Fig. 22). The granulating area thus exposed showed some slight amount of exudate present. This was sponged away with hydrogen peroxide. On account of the slowness of this process and the late development of infection, the left foot and leg up to the knee were dressed in a Dakin compress on August 5, while the remainder of the burns were left exposed. This was not accompanied by the development of any further toxæmia. The following day the entire left leg was Dakinized. This resulted in a prompt separation of the coagulated tissue except over the areas burned to the third degree. On August 7, the right leg from knee to foot was placed in a Dakin compress and the following day the entire leg was Dakinized. On August 14, the burns were exposed continuously to air. Healing then went on uninterruptedly. On August 18, a pinch graft was done covering the posterior aspects of each lower leg and on August 29, the remaining areas were grafted. The patient was discharged on September 29, at which time all the lesions were healed.

Case 19. No. 48897, B. M., a white male, aged 28 years, was admitted to the hospital on August 23, 1924, for treatment of extensive scalds. There was a second degree burn involving the entire anterior aspect of the chest and extending down over the epigastrium. There was also a second degree burn of the lower face and neck. Both arms in their entirety showed a first degree burn. The urine contained neither albumin nor sugar. The burns were dressed with 5 per cent tannic acid. This was continued for 14 hours. The dressings were then removed and the patient was placed on a sterile sheet and a cradle was placed over the bed. This was covered with enough blankets to keep the patient warm and two bed-side lamps were arranged under the blankets to provide heat. Fluids were forced by mouth to 5,000 cubic centimeters daily. The maximum mouth temperature during the period of treatment was 99.4 degrees F. The burns remained dry. As the coagulated epidermis separated, the underlying epithelium was intact. This took place rapidly and the patient was discharged on August 30. On September 6, healing was complete.

Case 20. No. 48233. W. V., a white male, aged 39 years, was admitted to the hospital on August 8, 1924, for treatment of burns resulting from stepping into a tank of boiling water. There was a third degree burn involving the dorsum of the left foot and the lower third of the left leg. There was a second degree burn above this extending about 12 inches up the leg. His temperature was 99, pulse 80, and respiration 18 to the minute. The urine was negative for sugar and albumin.

The burn was dressed with a compress moistened with 2.5 per cent tannic acid. The following day there was but slight coagulation observed and the temperature rose to 100 F. A 5 per cent tannic acid ointment was substituted but this was not followed by any marked precipitation. This was applied once daily until August 13, when the burns were exposed to air. The second degree burn was now healed and the third degree burn presented a clean dry brown surface. The patient was discharged on August 26, at which time epithelization was occurring rapidly from the edges. A vaseline gauze dressing was used. During the period of observation on two occasions, the temperature rose to 100 degrees F., then fell to normal and remained so.

Case 21. No. 48619, A. L., a white male, aged 27, was admitted to the hospital on August 17, 1924, for treatment of burns. A ladle of molten slag tipped and the patient was thrown into it. He landed on his feet and tried to walk

Fig. 24. Case 23. Photograph taken on fifteenth day. A. Normal skin. B. First degree burn. C. Intact dry epithelial surface under second degree burn. D. Crusts over second degree burn.

Fig. 25. Case 25. Photograph taken 24 hours after accident, showing second and third degree burn of entire face.

out of it but stumbled and fell on his face and hands. He succeeded in extricating himself unassisted.

On arrival at the hospital his temperature was 98 degrees F., pulse 90 and respiration was 20 to the minute. There was a second degree burn of the feet which had been protected by heavy shoes and woolen socks which had formed a protective charred mass which conducted heat poorly. There was a third degree burn beginning at the tops of the shoes involving both legs in their entirety extending upward over the buttocks to the crest of the iliac bones. On the lateral aspect of the thighs subcutaneous fat and fascia lata were exposed and burned. There was a third degree burn of the entire face, scalp, and neck. Fifty-three per cent of the total surface area was burned. The urine contained a trace of albumin. Blood findings are shown in Tables I and II.

The burns were dressed with compresses kept moist with 5 per cent tannic acid solution. A hypodermoclysis of 1500 cubic centimeters of normal saline was given and 8 hours after admission the patient received a transfusion of 600 cubic centimeters of citrated blood. The patient was further stimulated with small doses of caffeine sodium benzoate and adrenalin. Five per cent tannic acid was used for 8 hours and for the following 12 hours a 2.5 per cent solution was used.

After 20 hours the burns were exposed to air. The devitalized tissue was a dark brown color and over the thighs where subcutaneous fat was exposed the skin was dry and leather-like. The patient was placed on an air mattress covered with a sterile sheet. A frame was arranged over the bed and draped with sterile linen. Beneath this, bed-side lamps were placed to provide heat. Fluids were forced to 10,000 cubic centimeters daily. The urine after the first 24 hours did not contain albumin or red blood cells. Rectal temperature rose to a maximum of 102 to 103 degrees F., until August 25 when it reached 104 degrees F. Studies of the blood showed no remarkable retention of either non-protein nitrogen or urea nitrogen (Fig. 23).

On the ninth day after the accident the patient was digitalized. After exposure to air the burns were not disturbed further until the twelfth day. At this time large masses of burned tissue which had been coagulated were trimmed away. In places this exposed subcutaneous fat. During this entire period the patient complained very little of pain except in his hands which showed thrombosis of the vessels to the fingers and thumbs.

On August 28, a transfusion of 350 cubic centimeters of citrated blood was given. The patient was irrational at times but when spoken to always gave an intelligent answer. There was neither vomiting nor diarrhœa, but distention was a disturbing symptom. Another transfusion was given on September 4. At this time because of unavoidable pressure, the sloughs over the buttocks, perineum, and lower back, upon their separation showed deeper pressure sores which were infected with bacillus coli. Because of the extent of the lesions, it was possible to keep the patient on his side only a short time and this necessitated disturbing some other involved part. This broken down area soon involved the thighs where the skin in its entire thickness had been destroyed. Efforts were made to keep this clean by trimming away sloughs as rapidly as they separated, sponging carefully with hydrogen peroxide and then painting the area with a 1 per cent solution of acid fuchsin. On September 4, 5, and 6, there was little change in the condition of the patient. The rectal temperature was at a lower level than previously. The non-protein nitrogen and urea nitrogen were also at a lower level. The pulse was of fair quality and regular in rhythm, the rate varied from 110 to 130. Distention continued. There was no change in the patient's mentality.

Early on the morning of September 7, 1924, the patient vomited some bile stained material. He spit up some blood streaked mucus. Examination of the throat revealed very marked infection and this was considered the source of the blood. A voided specimen of urine showed a slight trace of albumin but otherwise was negative. The patient went into collapse and died the same day, the twenty-second day after the accident.

Case 22. No. 51863, J. P., a white male, aged 56 years was admitted to the hospital on November 1, 1924, for

Fig. 26. Case 25. Photograph taken on forty-ninth day.

treatment of a caustic soda burn. His temperature was 99.4 degrees F., pulse 72 and respiration was 18 to the minute. There was a second degree burn beginning at the wrist, encircling the forearm, extending upward and involving the lower third of the upper arm. The urine did not contain sugar or albumin. A compress was applied to the entire arm and this was kept moistened with 5 per cent tannic acid solution. After 20 hours this was removed. The surface was dry and was a light brown color. The arm was then exposed to air, a cradle was placed over it and was draped with sterile linen. On November 4, the temperature reached normal and did not become elevated subsequently. The urine remained negative for albumin, casts, and blood elements. A summary of the blood findings is recorded in Tables I and II.

After twelve days the dry, homogeneous crusts began to separate and beneath this there was an intact smooth epithelial surface. Each day the curled up edges were carefully trimmed away without endeavoring to hasten the process.

The patient was discharged on November 21, 1924, at which time the lesion was healed except over several areas about a centimeter in diameter on the forearm where epithelization was not complete. These areas were covered with vaseline gauze.

Case 23. No. 33710, W. L., a white male, aged 50 years, was admitted to the hospital on November 3, 1924, for treatment of burns resulting from falling into a shallow tank of boiling water.

His temperature was 99 degrees F., pulse 60 and respiration 20 to the minute. There was a second degree burn of both legs beginning at the ankles and extending up to the knees. There was a second degree burn measuring 15 centimeters in width and 30 centimeters in length on the posterior aspect of the right thigh. The lower third of the thighs revealed a first degree burn. The urine contained a trace of albumin. (Blood findings are given in Tables I and II.)

The burns were covered with cellosilk and a compress moistened with 2.5 per cent solution of tannic acid was placed over this. The dressing was removed after 18 hours and showed no evidence of coagulation. It was believed that the solution had not soaked through the perforations. Gauze moistened with the same solution was then placed in direct contact with the burned area and continued for 18 hours. Upon removal, the surface was a light brown color and dry. The gauze adhered at a few small areas. The burns were then exposed to air after first draping sterile linen over them. The temperature reached its maximum on the third day after the accident when it became elevated to 101 degrees F. and after the sixth day remained normal.

On November 14, the second degree burns were covered with large dry scales, which when removed revealed a surface covered with pink, intact epithelium (Fig. 24). As much of this was removed as would separate without causing trauma to the new underlying epithelial cells. The following day complete removal of the coagulated layer was accomplished. The entire area was epithelialized. The patient was discharged on November 21.

Case 24. No. 52559, W. W., a white male, aged 26 years, was admitted to the hospital on November 17, 1924, for treatment of burns received in the flash of a gas explosion. His temperature was 98 degrees F., pulse 90 and respirations were 18 to the minute. There were second degree burns of the left cheek, left ear, back of neck, dorsum of left hand and wrist. There were first degree burns of the right hand and wrist and the remainder of the face and right ear.

The hands and head were placed in a gauze compress, moistened with 1.5 per cent tannic acid solution. This was used for 24 hours on the face and 48 hours on the hands before satisfactory coagulation was obtained.

The patient was discharged on November 24, at which time, desquamation was well advanced on the areas burned to the first degree, while the second degree burns were covered with large, thick, dry scales, which when removed revealed a clean, healed, epithelial base.

Case 25. No. 52221, J. S., a white male, aged 36 years, was admitted to the hospital on November 10, 1924, for treatment of burns. He was working near a 5 gallon pail of varnish remover which became ignited. He grasped the handle in an effort to throw it away from some other inflammable material and it poured over his head and right hand. His temperature was 98.6 degrees F., pulse 90 and respirations 20 to the minute. There were third degree burns of both upper eyelids, the bridge of the nose over the malar prominences, left ear, left mastoid region, left frontal region, chin, dorsum of the left hand, and dorsum of the right hand. The remainder of the face and neck and remainder of both hands and wrists revealed second degree burns. There was a second degree burn of the left chest measuring 12 centimeters in length and 7 centimeters in width. The urine contained a faint trace of albumin. (See blood findings in Tables I and II.) (Figs. 25 and 26.)

The burns were dressed with a compress saturated with 5 per cent tannic acid solution. Around the eyes a 5 per cent tannic ointment was used. This was continued for 20 hours and the burns were then exposed to air. The maximum rectal temperature occurred on the second day when it reached 101.4 degrees F. Rectal temperatures did not show the wide variations so often seen in burns of this severity, but instead remained constantly between 99.8 and 100.6 degrees F., finally reaching normal on the seventeenth day. As the coagulated tissue separated, an intact epithelial surface presented except over the third degree burn of the left hand. After the first twenty-four hours the urine remained albumin-free. A pinch graft was done on the hand on December 8. Healing was practically complete on December 22 and the patient was in condition to be discharged.

COMMENT ON BLOOD FINDINGS

In Table I are summarized the results of blood analyses for non-protein nitrogen, urea nitrogen, glucose, and uric acid. It will be seen from inspection of these data that the blood sugar and the non-protein nitrogen are generally elevated during the first 24 hours after the burn. The degree of elevation of these substances is usually directly proportional to the severity of the burn. Since the level maintained in many of the treated cases was normal or but little above normal, after the first 24 hours, it is worthy of note that a marked increase promptly followed the application of a wet boric acid dressing to burns in 2 cases previously treated with tannic acid only.

In Table II are presented the repeated blood counts and hæmoglobin estimations in 19 cases. The most important feature to be noted is the almost uniform occurrence of leucocytosis. In 2 cases only was there any blood concentration, if we may judge by the percentage of hæmoglobin and the number of red blood cells.

METHOD OF PROCEDURE

The method finally adopted in the management of cases of burns may be briefly described as follows: As soon as the patient is seen, he is given a relatively large dose of morphine sulphate hypodermically (for an average adult ¼ grain) to alleviate the intense pain. The burned area is then covered with dry sterile gauze pads which are held in place by sterile gauze bandages. This dressing is then soaked with a 2.5 per cent aqueous solution of tannic acid. This is thought to be the most desirable concentration, although solutions as dilute as 0.75 per cent and as concentrated as 5.0 per cent have been used in some cases described. It is essential that the tannic acid solution be made up fresh just before use, because it deteriorates upon standing with the formation of the far less astringent gallic acid.

In order to prevent the deep caustic tissue injury found by Schuetz to follow the application of concentrated tannic acid, small sections of the dressing have been opened for inspection at the end of 12 hours, 18 hours, and again at the end of 24 hours. As soon as the part is found to have assumed a light brown color, all dressings are removed. In order to facilitate removal of the dressings without pain to the patient and without causing further trauma, it has been found desirable to wet the gauze with fresh tannic acid solution shortly before this is done. The wound is thereafter left exposed to the air but is carefully protected from mechanical injury, chilling, and bacterial invasion by a suitable cradle draped with sterile linen. In the more serious cases artificial heat has been supplied by placing within the cradle so prepared one or more ordinary electric light bulbs.

In a few cases 5 per cent tannic acid ointment (made with equal parts of vaseline and lanolin as a base) was substituted for the aqueous solution. Although it appeared to have a definitely beneficial effect, it is far less efficacious than the former. The chief value of the ointment is in its use about the eyes, where the astringent solution cannot be used with entire safety.

One of the most essential features of the management of all burn cases is that of keeping up the fluid balance in the body. This is accomplished by forcing fluids by mouth, where possible, or by hypodermoclysis, proctoclysis or intravenous infusions according to the special indications in each case. Blood transfusion has been employed in some of these cases, apparently with favorable effects.

DISCUSSION

The foregoing review of case histories of burns treated with tannic acid brings out a number of striking facts in favor of the employment of this method of treatment.

In the first instance it is notable that the degree of toxæmia observed in the series of cases treated consistently with tannic acid solution was markedly less than that following other burns of similar extent and severity. Evidence of reduction in the intensity of the toxæmia is seen in the clinical behavior of the patients, the relatively low temperature curve, the slight degree of blood concentration, the comparatively low level of the non-protein nitrogen of the blood maintained, and finally the low mortality rate from primary toxæmia.

It is believed that lessening of the toxæmia should be attributed to precipitation of the toxic material of the burned tissue by the tannic acid applied since such an explanation is in keeping with all of the observed effects produced *in vitro*. The maintenance of local tissue dehydration by direct exposure to the air is probably an important factor during the early period of treatment. This not only prevents loss of body water but would appear to keep the toxic material out of solution. This explanation is strongly suggested by the cases in which symptoms of acute toxæmia developed promptly following the application of moist boric acid dressings to the dry encrusted surface.

The low rate of mortality in this series of cases is worthy of special note as evidence of lessened toxæmia and of reduced incidence of infection.

TABLE I.—SUMMARY OF BLOOD FINDINGS FOLLOWING BURNS. NON-PROTEIN NITROGEN, UREA NITROGEN, URIC ACID, AND SUGAR

Case	Date	N.P.N. Mgs. per 100 c.cm.	U.N. Mgs. per 100 c.cm.	Sugar Mgs. per 100 c.cm.	Uric Acid Mgs. 100 c.cm.
1	5–5	42.8	15.6	126.6	4.2
	5–6	31.8	13.1	181.8	4.6
2	5–12	30.6	14.5	90.7	2.4
	5–13	30.0	14.0	112.2	2.4
3	5–5	27.5	12.1	119.1	4.7
	5–6	28.0	10.3	168.5	6.4
	5–12	45.6	12.2	88.7	4.1
4	6–15	42.2	29.0	161.3	3.4
	6–17	75.0	24.8	100.0	5.0
	6–19	27.0	11.6	93.4	3.7
	6–23	75.0	37.4	133.3	4.2
5	5–5	27.0	10.7	108.1	3.4
	5–6	30.0	11.2	200.0	4.4
	5–12	39.5	14.0	137.0	2.2
	5–13	28.5	13.8	112.2	2.2
6	5–5	40.0	15.2	77.3	4.4
	5–6	46.0	20.2	101.0	2.6
	5–12	33.7	11.2	109.9	3.4
	5–13	33.7	11.0	72.5	3.2
7	5–5	31.2	12.7	76.1	3.0
	5–6	39.6	11.6	96.1	
	5–7	46.0	14.5	144.9	2.6
	5–12	50.0	11.2	112.2	2.4
	5–14	33.3	10.2	112.2	3.4
9	5–5	25.9	14.0	120.5	4.0
	5–6	48.2	16.8	117.6	3.6
	5–7	38.0	14.9	102.6	2.3
	5–9	41.6	19.1	142.6	2.0
	5–12	40.0	12.2	100.0	2.2
	5–14	25.0	8.1	94.3	3.2
11	5–5	37.0	13.1	80.3	4.4
	5–6	35.3		109.3	3.6
	5–12	41.0	15.2	99.0	4.2
	5–13	42.8	15.1	94.3	4.2
12	7–10	35.7	13.1	69.5	2.5
	7–12	36.1	11.6	61.0	2.4
	7–14	30.6	10.7	61.0	3.8
13	5–12	38.5	13.2	104.2	2.1
14	7–10	34.3	13.5	69.0	1.3
	7–11	25.0		73.5	
	7–12	29.1	8.9	79.4	2.0
	7–19	24.4	16.0	86.2	2.5
15	8–5	31.2		168.5	3.0
	8–6	40.6	11.6	113.6	3.2
	8–7	39.0	14.0	123.0	2.7
	8–9		12.6	144.9	2.1
	8–11	30.0	11.6	86.9	2.5
	8–12	34.9	15.4	82.0	1.9
	8–13	32.6	15.9	92.5	2.1
	8–14	28.0	14.5	96.1	2.4
	8–15	29.7	13.5	92.9	2.1
	8–16	27.5	14.5	79.4	2.3
	8–18	20.2	11.4	80.0	3.0
16	8–6	54.6	23.8	208.1	4.7
	8–7	83.1	48.1	147.2	4.8
	8–8	75.4	45.3	178.6	4.25
	8–9	60.0	35.5	100.0	3.93
	8–10	56.4	28.5	68.7	2.34
	8–11	52.6	28.0	97.1	2.41
	8–12	40.6	25.2	98.5	3.68
	8–13	42.8	29.0	85.5	1.48
	8–14	40.0	29.1	105.3	2.20
	8–15	49.2	29.0	108.1	2.04
	8–16	44.4	33.2	90.9	2.16
	8–17	41.0	26.6	85.5	1.8
	8–18	42.2	27.1	94.3	2.62
	8–19	34.3	24.3	95.2	2.4
	8–20	36.1	23.4	96.1	2.84
	8–21	50.0	24.3	90.1	2.65
	8–22	45.6	23.4	81.7	
	8–23		20.2	95.2	
	8–24	60.0	29.0	86.9	
	8–26	54.6	18.9	90.0	
	8–28	51.8	17.1	119.8	
	8–29	51.8	16.3	156.3	
	9–2	50.0	16.3	111.1	
	9–3	32.6	14.5	116.3	
	9–5	42.2	19.1	101.0	2.22
	9–8	34.9	16.8	102.0	2.50
16	9–11	30.0	17.7	90.1	3.26
	9–15	28.4	17.3	92.9	2.8
	9–18	31.9	18.2	95.2	3.28
	9–22	32.6	11.6	79.4	2.67
17	10–15	32.6	10.3	53.0	2.00
18	7–22	49.2	22.9	196.6	2.68
	7–23	49.2	23.8	100.0	2.76
	7–24	29.1	16.3	105.3	3.41
	7–25	24.0	11.6	100.0	2.16
	7–26	30.0	14.0	85.5	2.29
	7–28	24.8	12.6	72.0	2.45
	7–29	29.1	10.7	76.6	2.16
	7–31	25.9	12.6	95.2	1.74
	8–2	37.0	13.1	79.4	1.90
	8–3	29.7	13.1	69.0	1.70
	8–4	26.5	9.3	90.1	1.34
	8–5	28.9	12.6	84.1	1.60
	8–6	28.5	10.7	98.0	2.22
	8–7	28.5	11.6	100.0	2.00
	8–8	23.0	12.7	73.0	2.1
	8–10	33.3	18.2	88.7	1.82
	8–12	28.5	13.7	98.0	1.6
	8–13	27.3	11.6	86.9	1.53
	8–14	24.4	11.6	88.0	1.93
	8–15	23.8	12.1	94.3	1.82
	8–16	23.0	13.1	76.6	1.92
	8–17	28.5	16.3	65.4	1.00
20	8–9	24.8		76.4	2.29
21	8–17	41.6	19.6	204.1	3.9
	8–18	44.4	20.5	151.5	3.0
	8–19	33.4	20.1	88.0	3.01
	8–20	32.8	21.0	114.0	2.13
	8–21	30.0	14.9	92.5	2.00
	8–22	33.0	19.1	86.2	
	8–23	45.6	21.0	88.7	
	8–24	35.7	19.1	62.8	
	8–25	36.6	20.4	77.9	
	8–26	40.0	13.5	96.8	
	8–27	51.8	23.4	83.0	
	8–28	41.0	14.0	68.5	
	8–29	46.8	12.2	106.4	
	8–30	33.3	14.0	96.6	
	8–31	29.7	17.7	84.5	
	9–1	28.0	17.3	95.2	
	9–2	38.5	14.9	78.8	
	9–3	26.8	12.1	73.5	
	9–4	37.5	15.4	76.4	
	9–5	32.5	14.0	95.2	1.74
	9–6	34.9	14.9	123.5	1.00
22	11–1	34.9	17.7	81.7	3.51
	11–4	54.4	32.7	93.9	4.4
	11–6	48.2	29.4	87.4	3.67
	11–12	38.5	12.1	109.9	3.05
	11–15	26.9	15.4	80.7	3.15
	11–17	44.4	19.6	79.7	3.36
	11–19	42.2	21.9	73.5	3.28
23	11–3	33.7	14.0	86.9	4.21
	11–4	36.4	16.3	101.0	4.35
	11–5	28.5		86.2	
	11–7	23.8	13.8	99.0	2.55
	11–12	27.3	11.6	110.5	2.86
24	11–17	35.3	14.5	80.7	2.44
	11–18	35.3	12.6	79.4	2.67
	11–19	34.9	15.4	82.3	2.74
	11–21	23.0	12.6	69.7	2.49
	11–22	27.5	11.6	84.1	2.49
	11–23	29.7	11.6	79.7	2.58
	11–24	25.9	15.4	74.7	2.84
25	11–10	38.0	14.0	111.1	
	11–11	40.6	18.2	144.9	
	11–12	40.6	15.9	144.9	
	11–13	34.1	13.1	94.3	
	11–14	23.0	11.6	80.7	
	11–15	30.8	13.1	84.1	
	11–16	30.0	12.1	102.0	
	11–17	31.2	12.1	96.1	
	11–18	33.0	13.1	101.0	
	11–19	30.0	11.6	83.0	
	11–20	27.0	10.7	100.0	
	11–21	24.8	9.8	82.7	
	11–25	27.5	11.2	79.4	

TABLE II.—SUMMARY OF BLOOD COUNTS AND HÆMOGLOBIN PERCENTAGE FOLLOWING BURNS

Case	Date	R. B. C. per Cubic Millimeter	H. B. Per Cent	W. B. C. per Cubic Millimeter
1	5-6-24	6,540,000	111	30,700
2	5-12-24	3,670,000	66	5,000
3	5-6-24	5,240,000	100	
4	6-16-24	4,570,000	104	19,200
	6-23-24	3,680,000	72	26,400
5	5-6-24	4,720,000	106	
6	5-6-24	5,620,000	82	14,800
7	5-7-24	3,980,000	90	11,000
	5-9-24		86	10,200
	5-12-24	3,530,000	64	5,200
9	5-5-24	4,270,000	87	19,900
	5-7-24	4,310,000	89	10,600
	5-8-24	4,370,000	88	11,200
	5-9-24	3,030,000		8,300
	5-12-24	3,730,000	73	6,100
11	5-6-24	5,310,000		25,000
14	7-10-24	4,250,000	94	8,300
15	8-6-24	5,240,000	111	6,500
	8-15-24	5,110,000	102	6,500
16	8-6-24	6,190,000	134	30,100
	8-7-24	4,820,000	143	
	8-8-24	4,900,000	134	
	8-9-24	4,920,000	119	
	8-11-24	4,240,000	93	
	8-12-24	4,350,000	83	
	8-14-24	4,800,000	89	22,600
	8-16-24	4,920,000	90	23,500
17	7-10-24	3,680,000	67	21,400
	7-12-24	3,730,000	70	7,700
	7-13-24	4,220,000	69	15,800
	7-15-24	3,920,000	78	13,100
18	7-21-24		100	22,350
	7-25-24	4,300,000	102	14,200
	7-31-24	4,170,000	80	12,200
	8-8-24	3,940,000	82	19,500
21	8-17-24	5,350,000	111	15,000
	8-18-24	7,450,000	121	16,900
	8-28-24	4,180,000	79	17,800
	8-19-24	4,500,000	86	
	8-29-24			
	9-2-24	4,520,000		
	9-3-24	4,750,000	95	
22	11-1-24	4,050,000	73	
23	11-3-24	3,270,000	65	12,500
	11-10-24	4,020,000	80	8,400
24	11-18-24	4,470,000	90	10,400
	11-19-24	4,400,000	90	11,800
	11-20-24	3,900,000	78	11,600
	11-22-24	4,200,000	86	8,640
	11-23-24	4,700,000		10,400
25	11-10-24	4,650,000	90	10,000
	11-11-24	4,000,000	93	19,600
	11-12-24	4,960,000	94	10,000
	11-14-24	3,590,000	74	9,800
	11-17-24	3,750,000	72	13,000
	11-18-24	3,400,000	68	7,300
	11-19-24	3,100,000	74	15,400
	11-21-24	3,000,000	83	14,500
	11-25-24	4,500,000	90	12,300

Of the cases presented 5 showed burns involving considerably more than one-third of the total body surface. Of the 2 fatal cases, it is now felt that 1 (Case 4) might have lived had his burns been treated throughout as were the others, instead of by application of boric acid solution on the sixth day of treatment. The second fatal case (Case 21) lived 22 days, but finally died of exhaustion and secondary infection of the deeply burned and macerated tissues about the perineum, low back and legs at a time when the non-protein nitrogen of the blood was normal and other evidence of the so called burn toxæmia was absent.

Since the comfort of the patient in any form of therapy is a most important factor in determining its value, it is worthy of emphasis that the analgesic effect of the tannic acid is one of its most striking features. The burning sensation complained of by the patient has generally been relieved within one-half hour after application of the dressing and no further severe pain has been experienced. After removal of the tannic acid compress the dry coagulum which presents is insensitive of palpation, and exposure to air has not resulted in recurrence of pain. Narcotics have rarely been used in the series of cases treated with tannic acid after the first injection on admission and at night when it was felt that their use was desirable to insure complete rest. Much of the discomfort usually experienced by burned patients is due to exhausting and traumatizing dressings. With this method the patient is spared these experiences after removal of the primary dressing usually at the end of the twenty-fourth hour.

In the non-fatal cases of burns the most distressing feature is usually that associated with scar formation resulting in the disfigurement and partial incapacity. In the present study it has been most gratifying to observe a marked diminution in the amount of such scarring. This is doubtless due to 3 factors, namely a great decrease in the incidence of infection, decrease in the amount of irregular granulation formation and the provision of a superficial crust which acts as a bridge for the spread of new epithelium over the burned area. These effects are all dependent upon the nature of the change produced in the tissue, a change which gives rise to a condition similar to that seen in the Vosburgh treatment of granulating wounds.

On removing the tannic acid compresses from first degree burns, one observes that the degree of erythema is far less marked than usual, and in some cases there is a total absence of redness. In

place of this, one sees a dry, scaly and slightly darkened surface next to the unaffected normal skin. Various types of dressings have been tried after the initial coagulation, but this has been followed in each instance by a loss of the desirable effect of the tannic acid, especially in second and third degree burns. In these, a clean, dry surface, soon becomes macerated and covered with exudate following such applications. The subsequent treatment which has proved to be most satisfactory has been a modification of the Sneve (36) open-air method. By the preliminary use of the tannic acid therapy described, the irregular crust formation associated with infected pockets of exudate which required daily evacuation is entirely avoided. Instead of presenting this condition the surface is seen to have remained smooth, homogeneous, and dry. The coagulated layer remains slightly adherent to the underlying, unburned tissue, and thus prevents the loss of body fluid, while acting as a natural protective dressing. Later it is observed that epithelium grows rapidly under the bridge of dry crusts from the margins of the normal skin surrounding the burned area.

In the deep burns destroying the entire thickness of the skin, especially those over the dependent parts, such a thick layer of dead tissue intervenes between the surface and the normal tissue that the precipitating and drying effects of the tannic acid are occasionally lessened to such an extent that infection occurs deep in the slough. It is believed that even in these cases, the intensity of an infection is less marked than that observed in the macerated sloughs treated by other methods.

CONCLUSIONS

1. The preliminary treatment of burns with tannic acid compresses followed by exposure to air lessens toxæmia.

2. After coagulation of the devitalized tissue with tannic acid, the application of a wet boric acid dressing apparently causes a return of toxic symptoms.

3. Tannic acid as an initial dressing on a burn is analgesic.

4. The subsequent use of the open air method causes minimal trauma and promotes general comfort.

5. The local astringent effect prevents the loss of body fluid.

6. Secondary infection is markedly limited by the absence of a favorable nidus for bacterial growth.

7. Scar tissue formation has been less marked than that observed after treatment by other methods.

8. The protective layer of coagulated protein forms a scaffold for the growth of the young epithelial cells over the denuded surface.

It is a pleasure to express my appreciation to Dr. R. D. McClure for his encouragement during the progress of this work.

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THE USE OF PARAFFIN AS A PRIMARY DRESSING FOR SKIN GRAFTS[1]

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THE importance of skin grafting as a method of promoting healing, preventing and correcting deformity has become generally recognized only in late years although it is one of the first operative procedures to appear in medical history. Its field of usefulness has been steadily increasing due largely to the work of plastic surgeons who have enunciated clearly its principles and placed them on a rational basis. The utilization of the free, full thickness graft and the pedicle flaps of various types in reconstructive procedures requires a special knowledge and interest and should not be attempted by the casual artisan in this field, unless he is prepared to fulfill these requirements. A general surgical service, however, presents countless opportunities for employment of that simple form of graft, the Ollier-Thiersch type, which are not as yet grasped by everyone. As a method of hastening the repair of granulating wounds or of covering fresh skin defects, it is easy of application and fairly sure of result with a saving in time and comfort of convalescence distinctly worth seeking. The principles of its use have been well established and its technique fairly well standardized, but some difference of opinion still exists among surgeons as to the most satisfactory method of postoperative management. An experience of 8 years with a paraffin dressing for the Ollier-Thiersch skin graft has led us to record it. Many types of dressing have been advocated of both the moist and the dry varieties; especially popular are gutta-percha strips, silver foil, adhesive plaster, paraffined mesh gauze and open air under screen shields. None of these, however, have proved as satisfactory in our hands as the method here described. It is undoubtedly true that factors aside from the form of dressing applied after grafting are responsible for a large part of the success or failure of the procedure and that no method will obviate assiduous and painstaking care, but other things being equal the final result will vary with the technique of postoperative dressing.

The use of paraffin as a primary dressing to the Ollier-Thiersch graft is mentioned by J. S. Davis (2) without enthusiasm and its use as a late application to grafted surfaces is described by Douglas (3). The method has been used by us in about 150 cases in this clinic during the past 5 years with results that have been satisfactory. Prior to this time it was used in No. 22, General Hospital, B.E.F., during the years 1916–18 on a fairly large number of cases. We have used the Ollier-Thiersch graft for the types of cases usually advocated, that is to cover granulating wounds of traumatic or surgical origin, fresh traumatic or operative skin defects and ulcers of various types. This type of graft is never used on surfaces exposed to trauma nor applied to surfaces liable to contracture as the flexor aspects of joints as it must be borne in mind that this graft does not prevent contracture of underlying or surrounding scar tissue. The paraffin method of dressing is obviously not used in grafts in the mouth or around the eye where wax molds after the method of Esser (4) are used.

We believe that the best results are obtained by grafting on normal tissue rather than on a bed of scar tissue and that the thicker the cicatricial bed the less likelihood of a take and a satisfactory result. Whenever possible, old granulating areas to be covered are excised and the graft applied to the more nearly normal underlying tissue. Recent granulating surfaces are prepared for grafting by the application of Dakin's solution every 2 hours, the exuberant granulations

[1] From the Department of Surgery, University of Michigan.

Fig. 1. Cutting graft, tension maintained by throat stick covered with gauze.

being removed with scissors as often as necessary to keep the surface smooth and at least level with the surrounding parts. Complete sterilization of the wound is aimed at, but we have been unable to accomplish it in all cases especially in lesions of great chronicity. These surfaces are roughly tested by discontinuing the antiseptic and covering the surface with dry gauze for 24 hours when observation of the amount and character of the exudate gives an idea of what will occur when the graft is applied. This test is also advocated by McWilliams (6). In the case of granulating areas of this type in which sterilization cannot be affected an excision of the entire area is done if possible. If the excision can be done in an aseptic manner leaving a clean base, grafts are applied directly to this base. If however there is doubt on this point the base is resubjected to treatment with Dakin's solution and the graft applied later when the surface is satisfactory. There is no doubt but that grafts will take in the presence of sepsis, but the percentage of successful takes is much smaller and sterility of the wound is worth striving for.

After many attempts at using isografts we are convinced of their futility and always use autografts. A rather extended trial of isografts using donors with compatible blood groups gave results in our hands uniformly ultimately bad. The reaction of the isografts were similar to those described by Holman (5) either a sudden reaction causing an immediate disappearance of the graft or an apparent take followed in several weeks by a loss of the graft by disintegration. In one case large granulating areas on the anterior aspect of both thighs were grafted with skin from a donor with a similar blood group and an apparently perfect take secured, the area having a living

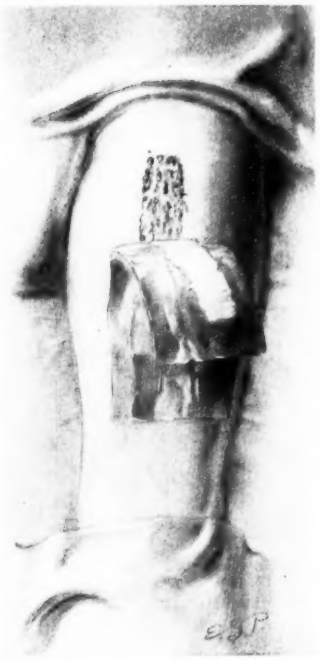

Fig. 2 (left). Picking up graft on gutta percha, lower end still attached.

Fig. 3. Graft placed in position, gutta percha partially removed.

covering for 7 weeks when the entire grafted skin literally melted away in a day leaving a granulating surface as before except for some diminution in size due to growth from the periphery. Grafts are taken whenever possible from the right thigh of the patient, each graft being cut as large as the area to be covered if possible, otherwise the grafts are cut so as to cover the surface with as few grafts as possible. Prior to cutting the graft the skin is either moistened with normal saline solution or lightly greased with a thin petrolatum as suggested by Parker (7). A large broad bladed amputation knife has been satisfactory for cutting the graft (Fig. 1). The graft is left attached at one end and dropped back in its bed being easily smoothed out by a stroke with the back of the knife blade and a piece of gutta-percha laid over it. The outer aspect of the graft adheres to the gutta-percha strip which is now picked up carrying the graft with it and the attached end of the graft is severed (Fig. 2). This can be floated in normal saline solution skin side up if it is desired to cut other grafts.

The grafts are now applied to the surface to be covered. If it is a granulating surface it has been previously prepared as described, and nothing further is done to it at this time. If it is a fresh surface of fat, fascia, or muscle, perfect hæmostasis is secured. Rather than risk a graft on a surface with doubtful hæmostasis we have resorted to the expedient of applying a pressure dressing of dry gauze to the wound and placing our saline solution keeping the grafts in the ice box. At the end of 6 hours, the dressing is removed, when all oozing has stopped and the grafts are applied as usual. The grafts can be cut any desired shape as they lie on the gutta-percha (Douglas, 3) and are placed wherever desired. Pressure is made on the graft through the gutta-percha and the gutta-percha is removed (Fig. 3). Any air or liquid bubbles present are now pressed out by gentle manipulation with a probe. Other segments of skin are placed in a like manner so as to overlap at their point of junction and also to overlap the margins of the wound. The grafts now in position are carefully dried of all gross moisture with cotton applicators.

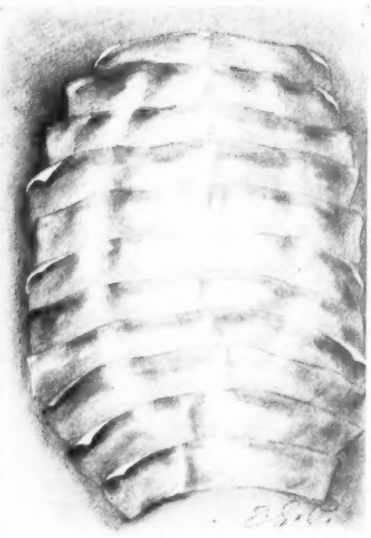

Fig. 4 (left). Grafts in position, covered with paraffin. The grafts are shown separated but should be slightly overlapped.

Fig. 5. Paraffin covered grafts "shingled" with gutta-percha strips ready for fluff gauze dressing.

Flexible paraffin of the type used in the treatment of burns is applied as a spray by means of the paraffin atomizer. The paraffin is maintained at a constant temperature just above the melting point of the wax in a water bath (Fig. 4). Care is taken not to hold the atomizer too close to the graft; a distance of at least 12 inches is usually correct. The entire grafted area and a margin of normal skin at its periphery is covered with a layer of paraffin at least 1.5 millimeters in thickness. The grafts are thus firmly anchored and their displacement by subsequent manipulations is unlikely. The entire paraffined area is covered with strips of gutta-percha each about 2.5 centimeters wide and as long as the wound. The strips are laid with an overlap (Fig. 5). Over this is placed a dressing of fluff gauze sufficient in amount so that the pressure exerted by the bandage or adhesive applied over it will have an elastic quality. A moderate, even pressure of this nature can be safely applied since the grafts are anchored by the paraffin and we regard this pressure as highly important in securing good results. This principle of pressure as applied to

Fig. 6. Ollier-Thiersch graft of large area on leg following excision of scar. Four weeks after grafting.

Fig. 7. Large annular ulcer of leg with contracture following burn 6 years previously.

the dressing of free, full thickness grafts has been emphasized by Blair (1) and McWilliams (6) and seems to us worthy of use in the management of the thinner graft.

After the retention bandage is applied, the part, if an extremity, is splinted to secure further security for the graft. After the grafted area is covered with its coat of paraffin a similar coating of paraffin is applied to the area from which the grafts have been removed. Over this a gauze dressing is applied and the whole covered by a bandage. This has proved to be a most comfortable covering for this at times uncomfortable area.

The time of the first dressing after operation will of necessity vary somewhat with one's conception of the degree of infection present. In grafts applied to a sterile fresh surface, the dressing need not be taken down for 5 days at least, but when dealing with a granulating surface we are in the habit of doing the first postoperative dressing on the third day. At this time the sheet of paraffin can be lifted from the grafts without in the least disturbing them. The amount of moisture present varies. If the surface is sterile the grafts are dry, pink and firmly fixed; if infection is present there will be some exudate present varying in amount and character with this factor. The amount of exudate, however, is always smaller in amount than one might expect. If the surface is dry and sterile, a dressing similar to the primary one is now reapplied and the subsequent dressings done every second day. If any infection is believed to be present, the wound is carefully cleaned with cotton pledgets moistened with Dakin's solution, then dried and exposed to the air under a screen or bed cradle. The further use of paraffin is discontinued in this group of cases, and they are exposed to the air during the day with careful cleansing twice each day. At night they are dressed with sterile petrolatum around the periphery of each graft and covered with gauze and bandage. In the uncommon case with profuse exudation and marked sepsis, moist dressings of Dakin's solution are used during the night. After the lapse of 3 days, there should be enough fixation of the grafts so that further splinting against displacement should not be necessary.

Fig. 8. Same patient as in Figure 7, following excision and grafting. The enormous surface to be covered necessitated leaving space between grafts. A useful leg 2 years after grafting.

The chief argument against the use of paraffin is that it seals the wound, causing a retention of secretion which will elevate the graft. We have not found this to be true so much as is the case when other impervious substances are used. We regard paraffin as valuable because (1) it fixes the graft at a time when a slip means disaster, (2) its splinting effect insures the application of a correct amount of pressure without danger of displacing the graft, and (3) when the time for its removal comes, the paraffin comes away freely without any tendency to stick and loosen the graft. All of these are factors important to secure a successful outcome.

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OIL STERILIZATION OF EDGED INSTRUMENTS[1]

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THE unsoundness of the method of sterilizing edged instruments by immersion in alcohol is shown by two recent reports demonstrating the presence of the bacillus aerogenes capsulatus in active state upon such instruments, even after they had been, supposedly, sterilized in alcohol solution.

In one instance, reported by Fritz Bruning,[2] 2 patients were operated upon with instruments used in a case of gas bacillus infection some days before. Both these patients developed gas bacillus infection and the presence of the organism upon the instruments employed was demonstrated by bacteriological examination. These instruments had been washed with hot soap suds after being used, dried, and placed in 70 per cent alcohol.

In the other case, reported by R. N. Nye and T. B. Mallory, gas bacilli were discovered upon a knife blade removed directly from the instrument cabinet and placed in deep tubes of bouillon. The writers then undertook the following experiment in order to determine the effect of the operating room sterilizing solution (70 per cent alcohol) on a gas producing, sporulating anaerobe. Six 6-inch pieces of fairly heavy wire (about 18 gauge) were inserted in an anaerobic plain bouillon culture of the gas producing, sporulating anaerobe obtained from a Bard-Parker knife blade. The wires were withdrawn, placed in a large sterile test tube, and incubated at 37.5 degrees C. until dry. Five of them were then placed in individual sterile test tubes containing the operating room sterilizing solution and allowed to remain for 5, 10, 15, 30, and 60 minutes, respectively. These five wires, as well as the sixth, untreated wire, which served as a control, were then cultured anaerobically in plain bouillon. All of them showed abundant growth and gas after 24 hours incubation at 37.5 degrees C. The observers concluded, therefore, that one and, possibly two of the fatal gas bacilli cases were due to infection at the time of operation from knife-blades or scissors, used 2 or 3 days earlier on a known case of gas bacillus infection and inadequately sterilized prior to re-use.

In view of these findings it became obvious that a more reliable method of sterilizing edged instruments must be employed than that of alcohol immersion. Many clinics tried to meet the difficulty by boiling the instruments in water. But, while boiling in water insures sterilization, it destroys the delicate edges of the instruments, particularly of knives, which is so important for sharp, accurate dissection. That an efficient and more desirable degree of sterilization may be obtained without loss of the delicate edge was demonstrated by Henry Lyman[3] of Boston.

The superiority of this, the oil sterilization method, is demonstrated here in the accompanying photomicrographic illustrations, showing the edges of instruments sterilized for varying periods of time in water, in alcohol, and in oil.

We wish also to present the plan of a compact and convenient sterilizer, designed for the New England Deaconess and the New England Baptist Hospitals by Leo G. Pelkus, Boston, Massachusetts.

The sterilizer consists of a cast aluminum shell or box with rounded corners and an outer shell of heavy polished nickel copper. The inner shell is the oil container. In the space between the two shells is a 1½-inch thickness of asbestos heat insulator, which effects a great economy of heat and also keeps the exterior of the sterilizer cool. A cast hinged cover is fitted to the machine, which, when closed, drops down into an oil-sealed groove, thus effectively preventing any escape of odor or of fumes, except through the special vent hole provided in the back of the sterilizer. This vent is piped to the atmosphere or it may be fitted with a new type of ejector vent valve, designed to withdraw any hot oil vapor. The sterilizer is fitted with a perforated tray, having non-heat-conductor handles, which can be raised or lowered simultaneously with the cover by means of a hand lever mounted on the side.

The sterilizer is heated by thoroughly insulated Cutler Hammer heaters, securely bolted to the bottom of the cast aluminum container. The best temperature for sterilization is 150 to 160 degrees C. and the wattage of the heaters is sufficient to bring the oil up to this point in not more than 30 minutes. The temperature of the oil is then thermostatically maintained at the point required for sterilization by an improved type of adjustable thermostat. This thermostat may, if desired, be set to control any sterilization temperature ranging from 100 to 160 degrees C. within one degree of the setting. Further accessories to the sterilizer include a snap switch, a pilot lamp, a drain cock,

[2] Deutsche med. Wchnschr., Leipzig, 1924, l, May 30, 717.

[3] Sterilization of surgeons' knives and scissors by heating in liquid petrolatum. J. Am. M. Ass., 1917, lxviii, 1907–1908.

[1] From the Lahey Clinic, Boston, Massachusetts.

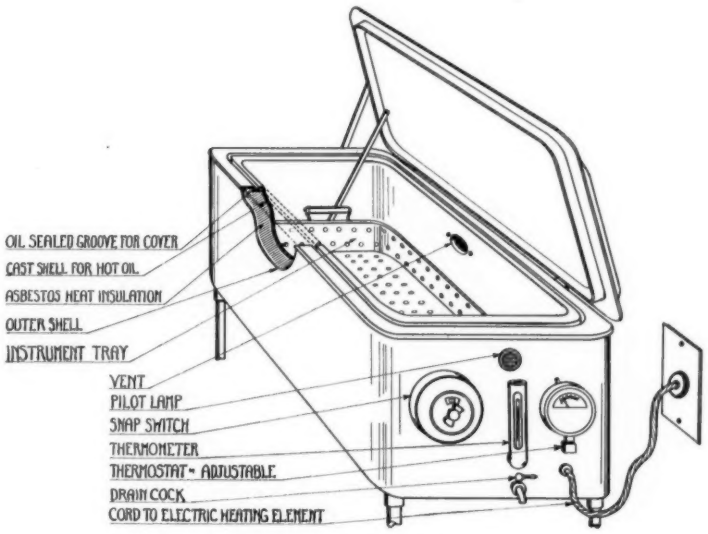

Fig. 1. Drawing showing sterilizer and parts.

Fig. 2. Magnified photographs of knife untreated (left) and after 10, 20, and 30 minutes in boiling water.

Fig. 3. Magnified photographs of knife untreated (left) and after 10, 20, and 30 minutes in 70 per cent alcohol.

Fig. 4. Magnified photographs of knife untreated (left) and after 10, 20, and 30 minutes in oil at 150 degrees C.

and a mounted thermostat which serves as a check on the temperature.

By thus thermostatically controlling the temperature of a highly purified mineral oil in a heat insulated container, it is possible to effect a great saving of heat. It is also possible to effect positive sterilization, at a known predetermined, constant temperature, without any injury whatever to knife edges or needle points, in a surprisingly short time. A working diagram of the sterilizer is shown (Fig. 1).

For the past year, we have sterilized our edged instruments in an oil sterilizer as described above. Liquid petrolatum is used, since this oil gives off

practically no odor when heated, and by virtue of its high flash point, is not easily inflammable. Knives, scissors, and needles are sterilized at a temperature of 150 degrees C for 10 minutes.

Aside from the assurance that one is using an absolutely sterile knife, further satisfaction arises from the use of the oil sterilizer in that the cutting edge is unchanged by the sterilization. We have for some time observed, in dissection, the difference in the cutting edge of knives boiled in water and those sterilized in oil. To ascertain if an actual change occurred in the knife edge after boiling in water, we took photomicrographs of the edges of three knife blades. One of the knife blades was then placed in boiling water for 10 minutes, one in oil at 150 degrees C. for 10 minutes and the other in 70 per cent alcohol for 10 minutes. Photomicrographs were then taken of the edges and again after 20 and 30 minutes treatment in boiling water, oil at 150 degrees C., and 70 per cent alcohol. In this way a series of photomicrographs were secured showing the effect on a knife blade of immersion in boiling water for 10, 20, and 30 minutes and a similar series showing the effect of oil sterilization and immersion in alcohol for similar periods of time.

These photomicrographs are shown in the accompanying cuts.

The destructive effect of the boiling water is clearly shown. The edges sterilized in oil show practically no change. Those sterilized in alcohol show a number of fine serrations, which might effect the edge somewhat, but these cannot be compared with the deep notching produced by the boiling water.

CONCLUSIONS

1. Sterilization of edged instruments by immersion in alcohol has been proved unsound.
2. Sterilization in boiling water is effective but destroys the cutting edge.
3. Oil sterilization is effective and does not destroy the cutting edge.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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AUGUST, 1925

"SILENT" INFECTIONS OF THE KIDNEY

THE autopsy table not only corrects many erroneous impressions but at times gives the clinician an awful jolt. It is astounding how frequently unsuspected kidney infections are found by the pathologist, infections which gave few, if any, symptoms. It is most fortunate for our patients that most kidney infections produce such definite symptoms that they may be easily recognized by a well trained physician. Often enough, however, the local symptoms are so slight or negligible that a diagnosis of renal involvement can be reached only by exclusion.

In cases in which for one reason or another ureter catheterization can not be employed (for instance, when the bladder is open) the clinician is liable to be in a quandary. He may, however, be in the same position even when he can avail himself of all the newer diagnostic aids and may fail to recognize a serious, perhaps a fatal lesion that involves the kidney cortex and does not communicate freely with the excretory channels.

It is highly probable that the peculiar lack of local (focal) symptoms is due to the fact that the causative agent is of attenuated virulence. In the cases that I have studied, the staphylococcus aureus and the colon bacillus have been the most frequent causative organisms. From my experience, there seem to be many cases of colon bacillus pyelonephritis, with multiple foci of suppuration in the kidney parenchyma, in which pain and local sensitiveness are very slight or completely absent. When ureter catheterization is feasible, unilateral or bilateral pyuria clarifies the picture, and the absence of local symptoms may fail to make a deep impression. If, however, such ureteral exploration is impossible, the cause of a mild or severe systemic reaction may remain in doubt as is often the case in patients whose bladders are draining. On the other hand, when the infection is limited to the kidney cortex, as in staphylococcus infections, when the urine is normal, when the most careful functional studies and pyelographic work show nothing abnormal, and when there are no local symptoms, the diagnostician is perplexed and must bear in mind the possibility of a "silent" infection of one or both kidneys.

Whether it will be possible to recognize such "silent" infections by newer methods of diagnosis, including activation of the focus by vaccination, further study will have to show. From experience in several cases of bilateral staphylococcus infection of the kidneys, I believe activation by vaccination with stock vaccines may be of some use. In these cases of bilateral kidney infections, the primary suppurative process, e.g., boils, had antedated the local symptoms by many weeks and at the time of the operation on the one kidney there was no suspicion of trouble in the second

organ. Within 10 to 12 days after operation, symptoms referable to the second kidney developed; and at operation perinephritis was found with purulent foci and cortical kidney suppuration identical with what had been encountered in the first kidney operation. The lesions on both sides corresponded so that one was forced to the conclusion that both kidneys had been infected simultaneously weeks or months before the first operation and that the second kidney infection had been "silent" until activated by the wound absorption following the trauma of the first operation.

Up to date, our experience in attempting to activate with vaccines silent foci in the kidney is very limited. Positive results in cortical infections seem to have been obtained. Further experience is necessary before certainty is established. Whether we can get similar activation in the colon group of infections with vaccination is uncertain. It should be kept in mind as a possible aid in clarifying a difficult clinical picture.

In brief, it may prove possible to activate "silent" kidney infections by producing a focal reaction, and thus the infection may be made "vocal." EDWIN BEER.

ABDOMINAL ADHESIONS

UNTIL quite recently, it was common practice for a surgeon to operate for adhesions even though the symptoms did not point to any very definite pathological process, often the chief excuse being a history of vague symptoms following a laparotomy, especially if the patient's discomfort developed about the site of the operation.

There was too great a tendency to connect the symptoms newly acquired with the former surgery. The patient was promptly told that adhesions had formed and the only hope of relief was in another operation. Unfortunately, only too often these patients, again disappointed, would return to the surgeon a few months later with the same symptoms perhaps in a more acute form. A few experiences of this kind suffice to make the observing and conscientious surgeon become wary of too hastily opening the abdomen on a vague diagnosis of adhesions. Not only will he make a most careful examination using all possible aids to make as definite a diagnosis as is humanly possible, but he will also look very carefully into the history of the patient given prior to the primary operation. It is of the utmost importance to know whether the symptoms that developed after the primary operation are identical with those given formerly and whether the first operation has really accomplished the results intended.

The use of the X-ray (with bismuth meal) has been a great help in the study of such abdominal cases, and no doubt it has prevented a good many unnecessary operations.

When all other conditions are eliminated and adhesions appear to be the only cause of the symptoms, the problem is not necessarily solved. It is surprising how few of these patients can be cured by just another operation. We all have seen patients return with more aggravated symptoms, pointing to greater masses of adhesions, than there were before the operation.

However, there are certain types of adhesions that are amenable to surgery. Undoubtedly the technique of the surgeon plays a very important part. Careful excising of one or more offending bands may give complete relief. When their reformation cannot be reasonably guarded against, the secondary operation may consist of a procedure in which the adhesions *per se* are not disturbed at all, but relief is sought through other channels. For instance, when massive adhesions are found about the gall-bladder fossa following cholecystectomy involving the duodenum

in such a way as to cause almost complete obstruction, gastro-enterostomy may be the operation of choice. When the transverse colon is found badly constricted, an ileosigmoidostomy may give better results and adhesions are left alone.

One of the problems that presents itself to us is how we can do our work so that there is only a minimum risk of postoperative adhesions. First of all tissues should be handled as little and as gently as possible. We should exercise great care in checking hæmorrhage, all raw surfaces should be peritonealized or covered with omentum or fat. In using hot packs we should be careful that they are not too hot, as too much heat applied to the tissues naturally promotes adhesions. Last, but not least, we should be surgically clean as infection is a very fruitful cause for adhesions. While literature abounds with suggestions of various foreign materials to cover over denuded areas, such as non-absorbable membranes and lubricants, thus far their usage has not been justified.

It is an interesting fact that some patients have a tendency to form very extensive adhesions on very slight provocation and there is no way of forecasting this tendency. If it were possible to determine this fact, it would often be wiser to let them suffer from the disease they have rather than disable them by an operation which might ultimately result in serious postoperative adhesions.

O. F. LAMSON.

MASTER SURGEONS OF AMERICA

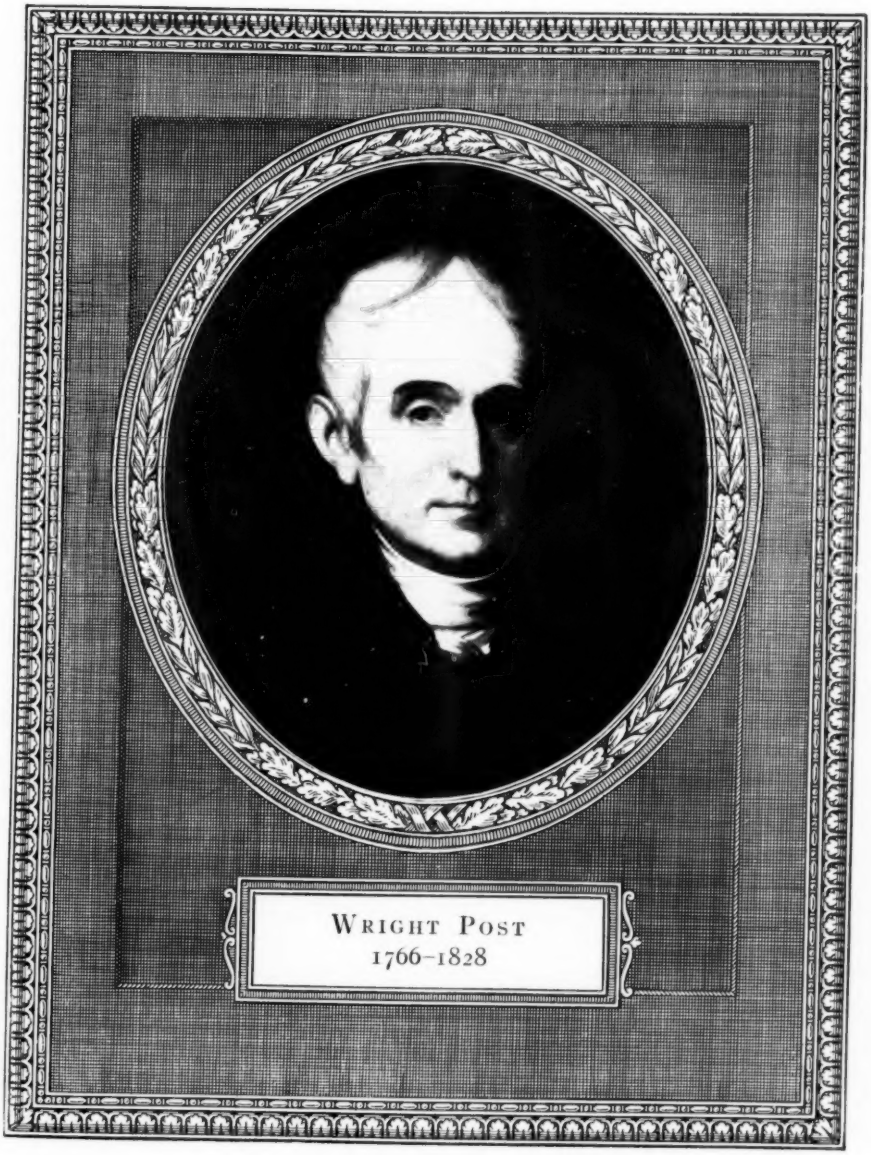
WRIGHT POST

WRIGHT POST was born February 18, 1766, at North Hempstead on Long Island and died at Throggs Neck, the Bronx, June 14, 1828. His father was Jotham Post and his mother was a daughter of Benjamin Wright. For nearly thirty years he was the leading practitioner in New York City.

At the early age of fifteen he began the study of medicine under Richard Bayley, a skillful and celebrated surgeon of New York. After four years of diligent and persevering work at home he went to London to become pupil to John Sheldon, renowned teacher of anatomy and surgery. In two and one half years, living most of this time with his preceptor, he undoubtedly absorbed much of the spirit and zeal of this great enthusiast.

On his return he began active practice and was soon delivering lectures in anatomy at the New York Hospital. These were interrupted, however, by the occurrence of what was called by the chroniclers of the day, the "Doctors' Mob." The reason for this demonstration was about as follows: During the preceding winter some local cemeteries had been invaded, graves opened, and bodies removed therefrom. The people were greatly outraged. They suspected doctors of using this means of acquiring dissecting material. On Sunday, April 13, 1788, children playing in the hospital yard saw a limb hanging out of a window. They told others and a crowd collected, entered the hospital, removed a couple of bodies which were later interred, destroyed some valuable specimens, and even sought the young doctors, several of whom the mayor and sheriff rescued by lodging in jail. The next morning a number of people gathered, searched the homes of the suspected physicians, but as they were not satisfied, in the afternoon they threatened the jail. The militia had to be called out. As these responded in small groups one, being surrounded and stoned, fired in self-defense, killing two or three and wounding others. The mob disbanded shortly after.

In 1790 Post married Dr. Bayley's daughter and the following year became associated in practice with his father-in-law. He was appointed professor of surgery in Columbia College in 1792, while Dr. Bayley was given the chair of anatomy. He then went to London again for further study and to procure a medical cabinet. Returning in 1793 he brought back the material for the first museum, according to John Augustine Smith, in the United States.



WRIGHT POST
1766–1828

This statement as to the priority of founding a medical museum in this country, however, may be qualified by the understanding of what constitutes a museum, for in Francis R. Packard's *History of Medicine in the United States*, the following notations are made: "Dr. Fothergill (England) sent on July 27, 1762, to Dr. Shippen at the Pennsylvania Hospital seven cases of anatomic drawings and casts toward the founding of a museum. Dr. Chovet brought from England a collection of wax models and dried and injected anatomical preparations, and in the winter of 1774–1775 he delivered a series of lectures illustrated by them. It would seem, therefore, that both Drs. Shippen and Chovet antedated Post with specimens for medical teaching."

During Post's visit in London he studied with Cruickshank, who, at this time, was working on the lymphatic system.

Post now exchanged chairs with Dr. Bayley, teaching anatomy while the latter taught surgery. He made his own dissections and preserved the specimens for his cabinet. Until 1813 when the medical department of Columbia College united with the College of Physicians and Surgeons, Post had remained professor of anatomy but under the new régime shared that chair with John Augustine Smith.

The Regents of the University of the State of New York in April, 1814, conferred upon him the honorary degree of doctor of medicine. Because of failing health he went abroad in 1815, for the third time, traveling especially in France where he visited the hospitals of Paris and Montpellier. His sojourn greatly benefited him.

He was chosen a trustee of Columbia College in 1816, which honor he held until his death. He was appointed president of the College of Physicians and Surgeons in 1821, succeeding Samuel Bard, and holding this office until 1826, when he resigned. He was a charter member of the Literary and Philosophical Society of New York, a member of the New York Historical Society, a member and active officer of the Medical Society of the County of New York and for 35 years one of the surgeons and a consulting surgeon to the New York Hospital.

His accomplishments in the medical world gained him practice and fame both at home and abroad. In 1796 he tied successfully the femoral artery for false aneurism of the popliteal caused by a bayonet wound. In 1813 he tied the external iliac for inguinal aneurism, being second only to Dr. Dorsey of Philadelphia in this feat in the United States. Post's was considered the more difficult operation because the peritoneum had to be opened. His master stroke in surgery, however, was tying the subclavian, in 1817, for brachial aneurism. In this operation he used for the first time the American needle employed in the ligature of deep vessels belonging to Valentine Mott, who assisted him. The success of this operation after the failure of such men as Ramsden, Aber-

nethy, and Cooper was thought to be a complete answer to the taunting question: "What have your American physicians and surgeons ever accomplished?"

A relative has said of Post as a boy that he was "remarkably quiet, amiable and accommodating but resolute and firm in his purposes and active both mentally and bodily. He was never known to engage in mischievous sports or dangerous intrigues and his mother was heard to say his conduct never afforded her uneasiness." As a man he was tall, handsome, dressed stylishly and wore his hair powdered and in a queue. He had not the time and maybe not the inclination for great attainments in the arts, literature, or science. He read little, was averse to writing, and was not brilliant in speaking. His lectures, however, were delivered calmly and with crisp clearness, such as is often lacking in those who are perhaps confused by the complexities of greater learning or more imagination.

Many thought him inwardly cold, but on occasions he showed deep concern and the greatest tenderness. John Augustine Smith in speaking of his position at the head of his profession says: "To acquire and maintain that station two things are necessary—the confidence of the public and the good opinion of the faculty. To obtain the former mere ability will in a great degree suffice but to secure the latter something more is required, virtue must be superadded, a flaw in the heart being here as fatal as a defect in the head. But so unlimited was the confidence of every practitioner in the city in the honesty of Post that no patient could be more anxious to receive the benefit of his advice than the attending physician was ready to meet him in consultation. The public appreciated his talents and the profession relied on his virtues. And what renders Dr. Post's character in this respect the more praiseworthy is that while perfectly correct himself he well knew how to rebuke and to punish any medical man who should infringe with regard to him those rules of good conduct and gentility which should regulate medical intercourse." He thinks we may deduce two useful lessons from Post's life: "First, that Fortune is not so capricious in her favors as many imagine; and second, to secure those favors, in other words, to attain the success of Dr. Post we must first acquire his skill and tact and what is perhaps more difficult, certainly more rare, we must practice these qualities with his steadiness and virtue."

ALFRED STILLMAN.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD MARCH 20, 1925, DR. CAREY CULBERTSON PRESIDING

A UTERUS FROM A WOMAN DYING OF SEPSIS AND HÆMORRHAGE FROM A TEAR OF THE CERVIX

DR. W. B. SERBIN, pathologist of the Chicago Lying-In Hospital: The specimen presented is a uterus from a woman dying of sepsis and hæmorrhage from a tear of the cervix. Mrs. M., age 36, viii-para, was received at the Chicago Lying-In Hospital almost *in extremis*. The history was contradictory, the first statement being of a version performed for prolapse of the arm; the second—by a sister who was present—that of a breech extraction. It seems certain that the woman had had little or no uterine action previous to operation. During the procedure which was done at home without an anæsthetic, the woman complained of great pain and went into shock. The delivery was followed by a profuse hæmorrhage. The child lived.

On the fifth day the patient again bled profusely, the uterus was packed and patient rallied. The packing was removed the next day. The temperature had risen steadily after delivery and when the visiting nurse discovered the family, the patient was in an advanced state of anæmia and infection. After admission to the hospital the usual restorative measures did not improve her condition. This steadily grew worse although there was no further hæmorrhage. The temperature was 103 degrees F., pulse 136, red blood corpuscles 1,730,000; white blood corpuscles 17,000; her appearance was ghastly and subicteric. There were no signs or symptoms of peritonitis or pneumonia but the liver dulness was increased. A transfusion of 550 cubic centimeters of her brother's blood was made, the blood of the two having been first carefully matched. This was followed by an attack of cyanosis, dyspnœa, and increased rapidity of the pulse. Shortly after this had passed over, the patient began to bleed from the vagina, and 1 hour after this appearance there was a profuse flow.

Examination showed that there was a cervical tear on the left side and that the hæmorrhage came from an opening near the outer lip of the tear. It was clamped with a volsellum and the uterus packed, but the woman died from hæmorrhage on the table.

The autopsy confirmed the diagnosis of general puerperal septicæmia. There is visible on the specimen herewith presented the positive evidences of a septic endometritis with superficial gangrene of the endometrium especially marked at the placental site. The infection is mainly lymphatic and the broad ligaments as well as the pelvic connective tissues are inflamed and infiltrated. There is a beginning pelvic peritonitis over the areas of pelvic cellulitis. The spleen was soft, almost fluid; the liver enlarged, yellowish-white—likewise septic. Of especial interest is the cause of the hæmorrhage. There is a deep cervical tear on the left side extending almost into the broad ligament. The sinuses of the cervix and lower uterine segment are unusually well developed and in the base of the ulcerated area one could see when the specimen was first cut open, the openings of the sinuses filled with soft blood clots. These sinuses can still be seen. About 1 centimeter from the external os, 1 of them as large as a goose-quill is visible which was the source of the fatal hæmorrhage. It is from this spot that the bleeding was seen to be the worst.

UTERINE FIBROID WITH A SECOND LARGE FIBROID GROWTH ATTACHED BY A PEDICLE TO THE PERITONEAL SURFACE BETWEEN THE LEFT TUBE AND ROUND LIGAMENT. PAPILLARY DEVELOPMENT APPEARING ON THE PERITONEAL SURFACE OF THE TUBE AND OVARY

DR. CAREY CULBERTSON: The patient in the first case was a negress, 25 years of age. She had complained of pain in the lower abdomen for 3 weeks. The onset was sudden while she was at work and increased in severity until she had to go to bed. The pains were cramping in character, and she vomited at times during the first 2 weeks of the illness. She then noticed a lump or swelling in the left lower abdomen. Her menses occurred first at 16 years of age, every 15 days, duration 7 to 8 days, regular and profuse, so that she bled about half the time. She had never been pregnant. She was a poorly developed and somewhat emaciated woman, with a temperature of 100 degrees F. upon entrance to the ward (February 27, 1925). Her abdomen was thin walled and distended in the left lower quadrant by a hard irregular mass above the pelvis, free but tender when moved. Centrally situated was another large hard mass plainly within the pelvis. Voluntary rigidity was elicited on both sides on palpation.

By vaginal examination the cervix was normal; but the corpus was upright, enlarged, and continuous with the mass in the central portion of the pelvis and apparently not connected with the higher left mass except by a pedicle. The right pelvis was empty. Leucocytosis was 11,600; hæmoglobin 80 per cent. At operation there was found occupying the upper left pelvis and lower abdomen a large free fibroid growth attached by a pedicle to the outer surface of the left broad ligament between the round ligament and tube. The growth, 10 by 12 centimeters, was free and its pedicle a narrow flat one, not twisted. The central mass was a multinodular uterine fibroma.

According to Seaver, who has recently reported a case of this sort with twisted pedicle, these independent fibroid growths are not common. The first case was reported by Burnam in 1867. Senn, in 1895, collected 11 cases in the literature. In 1907, 12 cases were reported in the American literature, while in 1906 Doran reported 32 cases in the English literature. Two other cases were reported by McNeil and Hamilton and 2 or 3 others were cited without description.

This tumor occurs most frequently within the broad ligament and close to the uterus. Most of the foreign cases and all the early American ones were of this type. It rarely occurs in outer portions of the broad ligament. Only about 12 cases were pedunculated. It is always unilateral. Some growths have weighed 10 to 40 pounds.

In my case no other cause than the growth described could be found to occasion the symptoms complained of by the patient. It is of interest to ask if these symptoms, so suggestive of twisted pedicle, may not have been caused by the tumor having become twisted and later straightened out.

The second specimen was a papillary growth on the peritoneal surface of the tube and ovary and was taken from a negress, 45 years of age, who entered the hospital complaining of a sharp aching pain in the lower abdomen of 2 years' duration. A swelling of the lower abdomen had been noticed for some length of time and this was thought to be increasing. For 2 months she had a poor appetite and some moderate loss of weight. The pain had been so severe recently as to cause her to go to bed. She had given birth to 2 children, 26 and 22 years ago, respectively. Her menopause occurred in 1924; there have been no periods since last September.

She was a thin, undernourished woman with some degree of hypertension, normal temperature, urine, and leucocytosis; hæmoglobin 60 per cent. The abdomen was soft, flaccid, diastatic, and protuberant below the umbilicus, because of a large round firm mass rising from the pelvis and projecting prominently forward. The vagina was shortened, the cervix forward behind the symphysis, and the pelvis occupied by a large firm mass the lower portion of which was cystic.

The specimen shown represents a uterus enlarged by a fibroid growth 6 centimeters in diameter which shows gray degeneration, with one small subserous growth attached. The uterine cavity is 8 centimeters deep, with normal mucosa. The right ovary is represented by a pseudomucinous unilocular cyst 15 centimeters in diameter, its contents *café-au-lait* in color. There are two flattened papillary growths on its outer surface and one small development of the same type on its inner surface. The right tube is adherent about the circumference of this cyst. The left ovary is a cystic mass, apparently a simple cystic degeneration, follicular, 6 centimeters in diameter, with the tube thickened and closed and adherent to it. Attached to the peritoneal surface of this left appendage by pedicles are several groups of papillæ, each the size of a bunch of currants. This appendage with its attached papillæ was free from any adhesions.

The microscopic sections showed all of these papillary growths to be typical papillary cystadenomata, nonmalignant.

INIENCEPHALUS, A CAUSE OF EXTREME DYSTOCIA

Dr. W. A. Newman Dorland presented a paper entitled, "Iniencephalus, a Cause of Extreme Dystocia" (see p. 180).

DISCUSSION

George W. Bartelmez, Ph.D. (University of Chicago): All that I can contribute to this discussion is to say something about possible causes of monsters such as these. It may seem a far cry from flat worms to human monsters but the general conclusions reached by Child, from his experiments on these and other simply organized animals, provide us with the best working hypothesis of the origin of such abnormalities in development as may be caused by the immediate environment of the embryo. It has been shown that certain poisons and all anæsthetics act in the same general way, inhibiting developmental as well as regenerative processes. The specific results obtained are due to the time at which the untoward influences act, their duration and their intensity. According to Child's theory of gradients the regions of an embryo which are most active at any given time not only dominate neighboring regions but are the most susceptible to injury.

The majority of monsters show defects of the nervous system and those which can be explained as due to a failure of the neural folds to close must be referred to the end of the third and the fourth week of development. We have now a sufficiently close series of anencephalic monsters and spina bifidas to say that in these cases everything develops normally except that the brain ventricles or the central canal remain in communication with the amniotic cavity; the degeneration of the central nervous system is due to maceration in the liquor amnii. The skeletal defects, I think, are secondary to the fact that the lining of the central nervous system has remained in continuity with the outer skin. In the case of iniencephalic monsters the neural defects may easily

be explained as failures of the neural folds to close and the characteristic flexure may have been present in neural fold stages.

The purely mechanical explanations of defects such as the presence of amniotic adhesions and bands are gradually being shown to be untenable. They are secondary rather than causal, in my opinion.

DR. HENRY F. LEWIS: I have two or three slides to show which illustrate cases of iniencephalus that I have had.

As Professor Bartelmez says, the original conditions are not shown in these late cases and we can only show the final stages. Most of these pictures were taken before we knew much about the X-ray. One case of iniencephalus shown in these slides occurred in the Cook County Hospital some 3 or 4 years ago, but we did not have a chance to X-ray it. Some of these pictures were taken from specimens in the museums of Rush and Northwestern Universities. Two slides are from pictures of a case of my own, the mounted skeleton of which is in the Rush collection.

ETIOLOGY OF PRE-ECLAMPTIC TOXÆMIA FROM A CLINICAL ASPECT

DR. EUGENE CARY discussed the subject of pre-eclamptic toxæmia from a clinical aspect (see p. 194).

DISCUSSION

DR. C. S. BACON: I think that this paper represents a great deal of work. It has not, however, solved the question of the cause of eclampsia, and the author did not claim to. The longer it goes and the more attempts we make to dig into the cause of eclampsia, the more discouraged we get. I remember how encouraged we all were along in 1890 when Schmorl and Veit discovered that emboli from the placenta would explain the production of eclampsia. We were encouraged the same way that others were encouraged some years before when it was discovered that the kidneys, and albumin in the urine, could explain eclampsia. From that time on we got more and more discouraged because the new theories did not explain eclampsia. The work is well worth doing today, but it is particularly encouraging I think that the author would take such an eclectic view of the subject, and conclude that the one important fact is diet. I believe that is what most of us do believe——that the by-products from the intestine have a great deal to do with the production of toxæmia and eclampsia. That being the case, the method proposed is very desirable.

DR. HILLIS: Dr. Cary is to be congratulated on the decrease of eclampsia in his clinic. The number of theories advanced regarding the cause of eclampsia indicate how little we know about it. We naturally turn to the laboratory for a solution of the problem but it seems we have learned about as much from clinical experience as we have from the laboratory.

Three facts seem to be fairly well established at this time: (1) most eclampsia can be prevented, (2) a rather large percentage of patients will die regardless of what we do for them, and (3) the kidney changes are a secondary effect rather than a causative factor in the disease.

If it was generally known that the diagnosis of threatened eclampsia should not depend upon albumin or casts in the urine, but that rising blood pressure and appearance of the other well known symptoms are of even greater importance, the outbreak of convulsions could be more often prevented.

DR. N. S. HEANEY: I did not understand from the body of the paper whether this guinea-pig that had the convulsions was injected with an eclamptic placenta or the placenta of a normal woman.

I understood that in the analysis of these 1,000 cases there were 54 cases of hyperacidity of the urine. I am wondering if Dr. Cary makes a practice of titrating the urine for acidity; and if so, if he noticed any other phenomena regarding the hyperacidity in the analysis of the cases.

DR. T. J. DOEDERLEIN: During my sojourn in the Orient I saw many cases of eclampsia. I was stationed in a remote, very poor country district where people lived almost exclusively on rice or raggi. If carbohydrate diet changes the intestinal flora so that putrefactive conditions are not present, I am at a loss to understand what agency produced these many cases of eclampsia among rice-eating people. I found acute and chronic Bright's disease as a result of neglect of acute infectious diseases very common. Possibly this might be a factor. Statistics could not be compiled as only pathological cases were brought to the hospital. We probably had not a half dozen normal cases.

DR. JOSEPH L. BAER: I am very much interested in Dr. Cary's clinical viewpoint and in his prophylaxis, which seems to have reduced the number of eclampsias almost to the vanishing point in a comparatively large series of consecutive cases. I am wondering whether in the prenatal instruction for his primiparæ in the late weeks of pregnancy he is advocating regular sweats. I read an article by I. D. Macht and D. S. Lubin in the *Journal of Pharmacology and Experimental Therapy*, January, 1924, which was one of the most beautiful pieces of research work I ever had the pleasure of reading. It had to do with the determination of the existence of a menstrual toxicity. For ages it has been known that menstruating women who attempted to knead dough inhibited the raising of the bread. Likewise, in the perfume factories of France, girls are barred from handling the delicate essences during the menstrual period. Other observations are mentioned indicating a very definite existence of the belief that the menstruating woman is toxic. Then the authors selected a certain vegetable form the growth of which is very rapid and very regular and with these vegetable formations in test tubes performed innumerable experiments with the co-operation of the women workers, utilizing the various secreta of these women both in the menstrual and non-menstrual periods,

demonstrating to their complete satisfaction that the sweat, the urine, and the blood at the menstrual time had a very definite inhibiting effect on the growth of these spores and at the non-menstrual period had little effect. This to my mind was to a certain extent a refutation of the teaching that sweat contains nothing but water and some salts and no toxins that have a bearing on the health of the woman. It would seem to indicate fairly conclusively that toxins are eliminated in sweat and therefore to justify the clinical procedure of sweating primiparæ in the late weeks of pregnancy.

DR. EUGENE CARY (closing the discussion): I would like to qualify one statement regarding the toxicity of the placenta. It is toxic.

In answer to Dr. Heaney, it was a normal placenta that was used. A series of experiments have been done by which all the different tissues that could be obtained have been used. The most toxic have been lung and placenta.

Regarding Dr. Hillis's remarks, the work of Gibbons and Teter is very interesting. I am a firm believer in their work, especially as related to the vomiting of pregnancy. I have worked independently of them and they have confirmed my thought. Carbohydrate feeding will control hyperemesis.

In answer to Dr. Heaney's second question, the urine was highly acid in 148 cases. I did not titrate all these urines. We do not because our clinic is too large. I have a solution of methyl red in 90 per cent alcohol which gives a very fair color index. The degrees of color vary from yellow to a Burgundy red which give us a pretty fair index as to the degree of acidity in the urine. I have never found but one case in which high blood pressure was present without hyperacidity of the urine.

From the literature I have found that the incidence of eclampsia is very rare in countries where vegetables and starches are predominant foods. In Germany during the war in one clinic there were only 2 cases of eclampsia in the year 1916 while there used to be 3 or 4 cases at all times. In these 2 cases the condition was definitely traced to the ingestion of meat.

In answer to Dr. Baer, we advocate sweats, but we do not insist upon them and the patients probably do not take them. In cases which we can check, if the blood pressure goes up and hypertension develops, we insist upon a sweat followed the next day by a dose of Epsom salts to promote elimination through the skin and through the intestinal tract; and then we try to get the type of bacteria if we can.

CORRESPONDENCE

THE INTERSTATE POST-GRADUATE ASSEMBLY

IN the Interstate Post-Graduate Assembly a movement has been inaugurated that will become epoch-making in its results, and establish a new era in the history of graduate instruction for practical physicians. It is the second-stage development of a vision that at first established the fact that there was in the conduct of medical societies a need for a plan that, without waste of time, would give to the practitioners of medicine and surgery, the real doctors, an opportunity to hear the leading specialists relate their experiences in actual practice, and illustrate their methods by the examination of patients (surrounded by the paraphernalia of an office or a hospital examining room) on a platform in a large, comfortable auditorium. Cities were chosen whose profession possessed the ability and enterprise to select describable cases, and the demonstrations were made by specially invited clinicians of note and ability who were able effectively to present their subjects to an appreciative audience of earnest practitioners. These "dry clinics," so called because they were only diagnostic in extent, did not involve operation or treatment.

The Tri-State District Medical Association of Illinois, Iowa, and Wisconsin developed and executed such a plan. In five years' time the sessions of this society became so popular that it was difficult for any ordinary city to accommodate its meetings.

The second stage of development began informally 3 years ago, when a group representing this same Tri-State Society visited the large clinical centers and observed the noted practitioners and operators in their regular workshops. This new plan sounded a call that could not be resisted by practical men whose sole object was self-improvement by absorbing knowledge from the actual experiences of men of broader opportunities.

Increasing numbers interested themselves in the movement. Men outside of the Tri-State Society demanded opportunity to become a part of it. Those who had already participated asked themselves why it would not be well to enlarge the scope and spend their vacations in this new type of graduate study. And the same leader was in the forefront to organize the new step in the evolution of their plans. The Interstate Post-Graduate Assembly was organized, its prospectus created, invitations extended to members of the profession for invasion of the clinics of the British Isles, France, and other European countries and in record time the accommodations were over-subscribed.

These medical pilgrims, eight hundred strong, planned to profit from every hour of their vacation study. Many of them were accompanied by their wives, who sought to take advantage of their husbands' sojourn in Europe to observe the things of interest usually sought by the vacation traveler. The majority of the members of the tour traveled from Montreal to Liverpool on the S. S. "Doric," of the White Star Line, a ship which was specially chartered and equipped to provide opportunity for the doctors to carry out prepared programs of discussion covering the range of medicine and the specialties.

In the meantime, plans were in process for two years, under the direction of the leading professional men in the cities included in the European itinerary, and professional and social programs were arranged. Each city had a committee on arrangements, with a chairman and organizing secretary, who in close cooperation with the organization head in America, Dr. William B. Peck, of Freeport, Illinois, completed every detail to receive and entertain their guests.

The Interstate Post-Graduate Assembly held its first formal meeting on European soil in Wigmore Hall, London, on June second, with an unusual audience of eight hundred, nearly all of whom were physicians from the United States and Canada. The inaugural ceremony was opened by the second son of King George V, H.R.H. The Duke of York, K.G., who as honorary chairman delivered a formal speech of welcome. This was followed by addresses of welcome by His Excellency, The American Ambassador, Hon. Alanson B. Houghton; The Right Hon. Neville Chamberlain, Minister of Health; Sir Humphry Rolleston, Bt., president of the Royal College of Physicians; and Sir John Bland-Sutton, president of the Royal College of Surgeons, to which an appropriate response was made by the president of the Assembly, Dr. Charles H. Mayo. The Duke of York then formally turned over the gavel to Dr. Mayo, the permanent chairman, who announced the opening of the scientific program and asked Sir Humphry Rolleston to occupy the chair. Papers were presented by Sir Humphry Rolleston, Bt., Sir William Arbuthnot Lane, Bt., Sir Thomas Horder, Bt., and Dr. Arthur F. Hurst.

On the mornings of June 2, 3, and 4 similar programs were carried out which included such well known speakers as Mr. James Sherren, Mr. A. J. Walton, Sir St. Clair Thomson, and Lord Dawson of Penn. The afternoons were spent at clinics and demonstrations in the medical institutions. Thirty-four hospitals were scheduled for clinics, including all of the great teaching hospitals so well known to medical men of America.

While the real work of the Assembly, judging from the attitude of this serious pilgrimage, was the pursuit of scientific knowledge, many private and general social entertainments were provided, arranged in such a manner as least to interfere with the scientific programs. Among the social events were: A reception in the nature of a "get-together" at the home of Mr. and Mrs. Herbert Paterson the evening of the first of June; a garden party at the London Hospital the afternoon of June 2; a reception by the Royal Society of Medicine the evening of June 3, preceded by a dinner at the home of Lord Dawson of Penn; a large reception and garden party at St. Bartholomew's Hospital the afternoon of June 4; many members of the Assembly were guests at the Thursday evening dinner of the famous Pilgrims, presided over by H.R.H. The Duke of Connaught, and the ladies were dined on that evening by Lady Lane; a reception at Lincoln's Inn Fields by the president, Sir John Bland-Sutton, and the Council of the Royal College of Surgeons, Friday afternoon; and at nine o'clock of the same evening, a great subscription dinner in the famous Guildhall, to Dr. Mayo, at which The Right Hon. Neville Chamberlain, Minister of Health, was the chief speaker. On Saturday afternoon the American Ambassador and Mrs. Houghton received all of the visitors at a garden party at their home, Crewe House. On Saturday evening a reception was given by the American Women's Club. On the same evening the Section of Surgery of the Royal Society of Medicine, under the presidency of Mr. Herbert Paterson, gave a complimentary dinner at the Cecil Hotel in honor of Dr. Mayo and the American guests. The above program was supplemented by many private dinners at which small groups were entertained in the delightful way that Londoners have of doing these gracious things.

But while the members of the Post-Graduate Assembly proved themselves normal individuals who enjoyed social functions, there was a seriousness about their attendance at the scientific sessions and clinics which demonstrated that their real business was to obtain first-hand information regarding the medical work of London. The same spirit was apparent in Dublin, at the clinics of our friends, Sir William I. de Courcy Wheeler, Sir William Taylor, and Sir Robert Woods; and in Belfast at the clinics of Professors Andrew Fullerton, R. J. Johnson and C. J. Lowry, and Mr. Thomas Sinclair Kirk.

"This is a wonderful audience," said Sir John Bland-Sutton as we looked from the platform at the inaugural ceremony. "Where do they come from"? One could but proudly reply that they represented the backbone of the medical profession from almost every province of Canada and every state of the United States; the cream of the progressive men of medicine, men who know their own shortcomings and yearn to better themselves by observing the work of others. From day to day it was more and more obvious that this is a great movement, and it did not require close observation to appreciate that the hosts of the Assembly, who were conscientiously furnishing scientific food to these Pilgrims, were receiving as much if not more inspiration than they were giving; and why not? No doubt the visit which was in prospect struck different individuals differently. "Of course we will receive these visitors. But we have the teaching of our students to attend to. How can we furnish material that will be of interest? How are we going to arrange to distribute so many observers? In what are they interested? Are they general practitioners or specialists? Are they teachers in universities? How are we going to entertain them? What will the Government do? Should the Assembly be recognized by the Crown?" But in all movements of this kind there is someone who knows the answer to these many questions, who knows how to divide the work, organize the forces, and present the program in such a manner as to make the whole confusing problem a simple one. The organization of this movement was superb. The immediate after-effect upon the professional men of London was no doubt one of relief; but it was easy to discern that there was a feeling of pride among those who had assumed unusual responsibilities, and even among the rank and file, because of the obvious success brought forth by their efforts. The great metropolitan press had observed, and published editorials which emphasized the importance of this visit of American doctors.

One great lesson was apparent to the onlooker, so obvious that it should not be overlooked. It is this: London and the large provincial cities—among them Leeds, Manchester, Liverpool, Dublin, Belfast, Glasgow, and Edinburgh—possess marvelous clinical advantages that are not now fully utilized for undergraduate teaching. If the facilities that are going to waste were thoroughly and permanently organized as they were casually and temporarily organized for the Post-Graduate Assembly, they would create a comprehensive graduate school under English-speaking teachers, and would command students in medicine of all English-speaking countries.

And the same may be said of the larger cities in the United States and Canada. Why is not this the time for the inauguration of such a movement? Has it not been demonstrated that there is an urgent demand when eight hundred practitioners of medicine have been knocking at the doors of Toronto, Montreal, and the cities of the British Isles praying for instruction? Have not these cities, including the capital city of the English-speaking world, shown their ability and willingness to undertake this important work? When better than now can the graduate teaching of the world be so organized as to keep it within the jurisdiction of our own people?

This appreciation by a much interested onlooker would not be complete without mention of the genius displayed by the leader of the movement, Dr. William B. Peck, who above all others was the key man and the organizer. In each of the large cities

there were those who did unusual work, but the selection of the London chairman of the British Isles Committees, Mr. Philip Franklin, was a most fortunate one. And every hour of every day all were proud of the presiding officer of the Assembly, Dr. Charles H. Mayo, who was always in his place ready to lend that prestige and steadying hand and leadership that every such movement must have to command respect and success. In all seriousness he performed his task, beginning with his response to the address of welcome by H.R.H. The Duke of York, and concluding at the head of a procession of three hundred patriotic citizens of America who solemnly marched down the embankment of the Thames to place wreaths upon the grave of the unknown British soldier in Westminster Abbey, and, immediately following, on the monument to Abraham Lincoln, thus symbolizing the unity of the great English-speaking countries.

FRANKLIN H. MARTIN.

CARTILAGINOUS TUMORS OF BONES

A FURTHER NOTE ON A CASE OF CENTRAL MYXOCHONDROMA

To the Editor: My colleague, Dr. V. H. Keiller, published an article in SURGERY, GYNECOLOGY AND OBSTETRICS on the significance of cartilage and bone tumors, in the April, 1925, issue. Since that time, the patient mentioned in Case 4, a "central myxochondroma with productive osteitis," returned for observation—4½ years after the original operation. He showed noted signs of recurrence, and I operated upon him again.

We feel that it is of great importance to publish a further note on this case to avoid any erroneous impressions which might arise from our report.

The patient returned to our service on March 31, 1925, 4½ years after his first operation. He complained of deep seated pain in the thigh and tenderness over the scar. He brought with him roentgenograms made in his home town, in March, 1924, and January, 1925. These showed much condensation of the bone at the site of the tumor, with a decrease in the total thickness of the shaft as compared with the original X-ray plates, and a marked increase in density. The total thickness of the femur in the affected area was still greater than that of the normal femur. Laterally, a hiatus is present, corresponding in situation with the area of peripheral bone removed at the primary operation, but about one-half the size of the cloaca then made. The roentgenological appearance of itself did not suggest recurrence, but rather a failure of the affected bone to return to normal after the removal of the tumor tissue. For the past 7 months, however, the patient has had pain, increasing in severity and in frequency until recently he has had constant deep aching pain in the thigh, and an area of intense tenderness over the operative scar. This area corresponds in position with the hiatus in bone, and is one-half inch in length soft to the touch not inflamed; pressure upon it produces immediate tenderness, and subsequent aching pain. Contrary to the advice given him, the patient had had no X-ray treatment following the primary operation. On account of the pain and tenderness, recurrence was suspected and exploration advised. The upper one-third of the medullary cavity of the shaft of the femur was filled with mucochondromatous material, as in the previous instance; the mucous tissue had penetrated through the hiatus and extended into soft tissues in this region only. The surrounding bone showed greatly increased density, and the infiltration was less extensive in its growth up and down the marrow cavity than at the primary operation. Gross and microscopic examination show essentially the same characteristics as were present in the primary tumor. The sclerosed bone of the shaft is more dense than formerly, and the myxomatous cells can be seen arising from the inner osteoblastic layer. The tissue in the interior of the marrow cavity shows more cartilage than formerly; the bulk of the tumor tissue is again mucous connective tissue (not mucoid degeneration). There are no atypical mitoses, nor other evidences of malignant change. The blood vessels are carried in fibrous tissue strands; those capillaries which lie in the midst of the myxomatous material have endothelial and not tumor cell lining. Small spicules of dead, partly decalcified, bone are present throughout the tumor mass, no active osteogenesis is present in the interior of the tumor. The character of the tissue is still histologically benign and the recurrence interpreted as the result of incomplete primary removal. Under the circumstances no operation short of the excision of the entire upper end of femur could have eradicated the primary disease. Undoubtedly, the chance of a subsequent recurrence is great, and if it occurs the tissue will probably tend toward a malignant transformation. The safest procedure at this time would be amputation at the hip joint; to this the patient will not consent. The freedom from metastasis and the lack of histological proof of malignancy lead one to hope for a further period of freedom from clinical symptoms. X-ray treatment will be used, in the hope of promoting further condensation in the surrounding bone, as well as inhibiting the growth of such tumor cells as have been left behind.

J. E. THOMPSON.

A MODIFIED MAYO UMBILICAL HERNIA

To the Editor: In an article by Dr. C. A. Roeder, of Omaha, on "A Modified Mayo Umbilical Hernia" published in the May, 1925, issue of SURGERY, GYNECOLOGY AND OBSTETRICS, I note that his description of the operation is practically the same as that given by me under the title "Cosmetic Operation for Umbilical Hernia" in the October, 1923, issue of the *Surgical Clinics of North America*. Unquestionably Dr. Roeder and I arrived independently at our conclusions, but I thought your readers would like to know of the earlier publication

R. E. FARR.

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED J. BROWN, M.D., F.A.C.S., Omaha

THE ALDINE EDITION OF THE COLLECTED WORKS OF THE ANCIENT MEDICAL WRITERS

PROGRESS denotes change and likewise dispute between radicals and conservatives. The pendulum swings first too far one way on the side of radicalism and then too far the other on the side of conservatism. Between the ends of its swing the golden mean is found and by gradual change and understanding of this point advance is made. This was just as true in sixteenth century medicine as at any other time in the history of the world. On the side of the radicals and their ideas of advance were Paré, Tagliococci, the Englishmen, Clowes, Gale, and Banister, and the Scotchman, Lowe. These men were some of them educated and knew the classics. Others, however, were not, but all of them wrote in the vernacular realizing the importance of transmitting knowledge to students who were not able to read and study the ancient Greek and Latin. In the other camp were certain members of the surgeons of the long robe who represented the reactionaries and were standpatters to the last ditch. An outstanding example of this type was Paré's life long enemy Gourmelin. To these men any advance beyond, or contraversion of, the dicta of the ancients was little less than sacrilege. To them the Vesalian anatomy was absolutely unbelievable and any surgical change ridiculous and not even to be considered. Though we can easily see how absolutely erroneous the stand of the reactionaries was we must still feel thankful to them as it was the means of furnishing us a very beautiful book, for such a condition of affairs would naturally not be overlooked by the typographers and they would see to it that desires of the conservatives were gratified by reprinting the works of the ancient writers. One of the foremost printing establishments of the time was the Aldine press at Venice. Aside from being good printers the men of the family were well educated savants who did much of their own editing and even writing. The elder Aldus Manutius (Teobaldo Manucci) founded the press in 1490 and began the publication of the Greek classics for which he designed the italic type which goes by his name and which was supposed to have been adapted from the handwriting of Petrarch. The elder Aldus' son, Paulus Manutius, succeeded his father after an interregnum during which the Asolini composed of Aldus' father-in-law and his two sons carried on the press and, being men of somewhat short sighted policy, the quality of the product ran down. Paulus determined to restore the pre-eminence of the press and devoted himself to publication of the Latin classics. During his connection with the press the product improved. Evidently seeing the opportunity for successful reprinting of the works of the old medical writers, for the Aldine books were not expensive and were printed in large editions and so had to command a ready sale, the press published in 1547 a compendium of medicine consisting of a collection of the works of the early authors written in Latin which was entitled "All ancient medical men who described, in the Latin tongue, varieties of and remedies for various diseases have been collected from all sources and included in one volume, in order that it may be consulted easily by all those who have devoted themselves to the study of medicine."

The array of authors whose works are published includes many of those whose names have been handed down as the leaders of their time. The diversity of subjects is chosen to cover the various departments of medicine. The first author is, as is fitting, the great Roman writer on medical subjects, Aurelius Cornelius Celsus (between 25–30 B.C. and A.D. 45–50) who, though not a physician by profession, contributed much to medical art, especially in descriptive and operative surgery. His eight books were printed in full. The work of Quintus Sorenus, written in the Latin hexameter which Tennyson calls "The stateliest measure ever moulded by the lips of man," follows. The Treatise of Trotula, presumed to be a female physician of the school of Salerno during the 11th century, which is devoted to the care of the pregnant woman before, after, and during labor is given place after that of Quintus. Then come in turn the writings of Marcellus (345–395); Scribonius Largus (A.D. 45); Soranus of Ephesus (A.D. 98+); Caius Plinius Secundus with his five books "Concerning Medical Matters"; L. Apuleus of Madaura: "Concerning the Virtues of Plants"; Antonius Musa: Aemilius Macer (15 B.C.), "Concerning Plants"; Strabus Gallus, whose herbal is written in hexameter; Caelius Aurelianus of Sicca in Numidia (about A.D. 400) whose ideas on diseases of the mind were far advanced for his time; and finally Theodorus Priscianus (about A.D. 380) whose medical work is dedicated to his brother Timothy, also a physician.

MEDICI ANTIQVI

OMNES, QVI LATINIS LI-

TERIS DIVERSORVM MORBORVM
genera & remedia perſecuti ſunt, undíque con-
quiſiti, & uno uolumine comprehenſi,
ut eorum, qui ſe medicinæ ſtudio de-
diderunt, commodo conſulatur.

Index in omnes pleniſsimus.

VENETIIS, M. D. XLVII.

REVIEWS OF NEW BOOKS

THE *Ergebnisse der medizinischen Strahlenforschung*[1] comprises monographs on X-ray diagnosis, X-ray, radium and light therapy, and is edited by H. Holfelder, H. Holthusen, O. Juengling and H. Martius. The object of the publication is to collect the writings and investigations of the physicians, surgeons, physicists, and pathologists which are now dispersed in the journals devoted to these specialties. Each monograph treats of a special limited problem and is based on the reports and labors found in the world literature. The first volume contains the following monographs: roentgen-diagnosis of malignant and inflammatory tumors of the colon, by A. W. Fischer; atrophy of the bones, by E. Friedl and H. R. Schinz; acute miliary tuberculosis in the X-ray picture, by A. Lorey; spectroscopy in medical roentgenology, by L. Grebe; ionization measurements of X-rays, by H. Kuestner; X-ray protection and planning of X-ray departments, by R. Glocker; physical sensibilization, by H. Holthusen; X-ray testicle, by R. Schinz and B. Slotopolsky; radiation treatment of cervical carcinoma, by W. Lahm; and X-ray and radium treatment of œsophageal carcinoma, by H. Kurtzahn.

It is not possible to discuss within the limits of a review the individual merits of these monographs which cover the work done by each writer as well as a review of the literature. The combined study of clinician, pathologist, and roentgenologist in the chapters devoted to diagnosis and the combined labors of clinician, pathologist, and physicist in the chapters devoted to therapy have materially contributed to the scientific presentation. For instance, A. W. Fischer concludes that roentgen-diagnosis in colon growths has come to be an important factor in the battle against the deadly cancer disease, though a roentgenologic diagnosis should only corroborate the clinical findings. It is of educational value to put the roentgenologic findings in writing and then compare them with the operative or autoptic findings. Only thus can we reduce the number of exploratory or diagnostic laparotomies, and also contribute to early diagnosis.

The monograph on the use of the X-ray in diseases of the testicle is especially instructive. Schinz and Slotopolsky state that the X-rays have an elective action determined by the "quantitative" peculiarities of the rays. These depend on the penetrability and dose. They found that the spermatogones, alone, may be damaged, as they are very radiosensitive. The sensitiveness of the different structures is as follows: the spermatogones are the most sensitive; the spermatocytes less, and the spermatids least of all. The X-ray doses which cause the desired effect have been exactly determined. The restitution of the testicle after X-ray treatment does not depend on the persistence of a few spermatogones, but results from the Sertoli cells, which represent merely a "reserve material."

Lahm presents his subject as a clinic on carcinoma of the cervix. He discusses diagnosis, selection of the methods of treatment, the technique of radium and X-ray therapy, the clinic of radiation sickness, the histological action of the rays, and finally the curative results of the various methods.

These few extracts give an idea of the value of these monographs. The reviewer has been greatly benefitted by the study. HENRY SCHMITZ, M.D.

THE avowed purpose of the *Annals of Roentgenology* to furnish authoritative data on particular phases of this specialty to serve as a post-graduate course and reference library has been admirably accomplished in volume v, on the teeth and jaws.[2] A brief review of the anatomy of the teeth and jaws is followed by a consideration of such technical details as are essential for proper portrayal and interpretation. Pathology is correlated with roentgen findings, and numerous excellent roentgenograms illustrating the various conditions add greatly to the value of the work.

Although intended primarily for roentgenologists, this monographic atlas has a wide general interest, especially as regards the subject of focal infection originating in this region. ADOLPH HARTUNG.

In their X-ray atlas of the normal and abnormal structures of the body, M'Kendrick, and Whittaker[3] treat the subject of radiographic anatomy and pathology under four heads: normal joints of the limbs, injuries and diseases of the limbs, head and neck, thorax and spine, and abdomen. The arrangement is sensible, comprehensive, and instructive. The injuries and lesions selected for illustration are well chosen and the legends and descriptive notes are clear, brief, and to the point.

The book should prove of value and interest to physicians and surgeons who desire to interpret roentgenograms, and to beginners in diagnostic radiology. I. S. TROSTLER.

WITH the appearance of the second volume of Sauerbruch's *Chirurgie der Brustorgane*,[4] a work which stands as a monument to the progress of chest surgery has been completed. In these two vol-

[1] ERGEBNISSE DER MEDIZINISCHEN STRAHLENFORSCHUNG (Roentgen-diagnostik, Roentgen- Radium- und Licht-therapie). By H. Holfelder, H. Helthusen, O. Juengling, and H. Martius. Leipzig: Georg Thieme, 1925.

[2] ANNALS OF ROENTGENOLOGY. vol. v.—Teeth and Jaws, Roentgenologically Considered. By Herman A. Osgood, M.D. New York: Paul B. Hoeber, Inc., 1925.

[3] AN X-RAY ATLAS OF THE NORMAL AND ABNORMAL STRUCTURES OF THE BODY. By Archibald M'Kendrick, F.R.C.S. (Edin.), D.P.H., F.R.S.E., and Charles R. Whittaker, F.R.C.S. (Edin.), F.R.S.E. New York: William Wood & Company; and Edinburgh: E. & S. Livingstone, 1925.

[4] DIE CHIRURGIE DER BRUSTORGANE. By Ferdinand Sauerbruch. Including a 2d ed. of Technik der Thoraxchirurgie by F. Sauerbruch and E. D. Schumacher; vol. ii, Die Chirurgie des Herzens und Seines Beutels der Grossen Gefaesse. Des Mittelfellraumes. Des Brustlymphganges. Des Thymus. Des Brustteiles. Der Speiseroehre. Des Zwerchfelles. Des Brustfelles. Berlin: Julius Springer, 1924.

umes everything of practical interest, in this field, is noted. As a textbook and as a reference book it is the undisputed authority on surgical conditions of the chest.

Volume II is devoted especially to surgery of the heart and mediastinal organs, to surgery of the diaphragm, and to the treatment of empyema. A very complete bibliography is appended.

The text is remarkable for its completeness. The author has drawn not only from his own tremendous experience but as well from all the available literature. Each subject is discussed under pathology, diagnosis, and treatment. Under the heading of treatment Sauerbruch describes his own procedures and also the most important of those advocated by other workers.

The publishers have spared no work or expense in the preparation of these volumes. The paper is good, the print clear, and the arrangement excellent. The indexing is surprisingly good, resembling in this respect much more the indexing of English and American texts than that usually found in German books. The illustrations merit particular praise. Innumerable reproductions of roentgen plates, clear and easily understandable diagrams, black and white drawings, beautiful life-like color plates of operative procedures or pathological conditions, explain the text so well that the fact that the book is written in a foreign language is almost overlooked.

The only adverse criticism the reviewer can make is one which is not due to any fault of Sauerbruch's but to the rapid advance in chest surgery; two very important contributions in the field of intracardiac surgery have appeared too recently to be included, the work of Duff Allen, describing his cardioscope and his technique of valvotomy, published in the *Archives of Surgery*, January, 1924, and that of Cutler Beck and Levine, presenting four clinical cases of mitral stenosis actually operated upon with the aid of their cardiovalvulotome, published in the *Journal of Experimental Medicine*, September, 1924.

RALPH BOEME BETTMAN.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

HAND-ATLAS OF CLINICAL ANATOMY. By A. C. Eycleshymer, B.S., Ph.D., M.D., and Tom Jones, B.F.A. Philadelphia and New York: Lea & Febiger, 1925.

METHODS AND PROBLEMS OF MEDICAL EDUCATION. (2d ser.) New York: The Rockefeller Foundation, 1924.

SURGICAL PATHOLOGY. By William Boyd, M.D., M.R.C.P. (Edin.), F.R.S.C. Philadelphia: W. B. Saunders Company, 1925.

INFECTION, IMMUNITY AND INFLAMMATION; a Study of the Phenomena of Hypersensitiveness and Tolerance and Their Relationship to the Clinical Study, Prophylaxis, and Treatment of Disease. By Fraser B. Gurd, B.A., M.D., C.M., F.A.C.S. St. Louis: The C. V. Mosby Company, 1924.

OPERATIVE SURGERY. By J. Shelton Horsley, M.D., F.A.C.S. 2d ed. St. Louis: The C. V. Mosby Company, 1924.

THE CRIPPLED HAND AND ARM. By Carl Beck, M.D. Philadelphia: J. B. Lippincott Company, 1925.

ROENTGEN DIAGNOSIS AND THERAPY. By Arthur C. Christie, M.D., M.S., F.A.C.P. Philadelphia: J. B. Lippincott Company, 1925.

THE BABY'S FIRST TWO YEARS. By Richard M. Smith, M.D. Boston: Houghton Mifflin Company, 1924.

PREPARATION OF SCIENTIFIC AND TECHNICAL PAPERS. By Sam F. Trelease and Emma Sarepta Yule. Baltimore: Williams & Wilkins Company, 1925.

ELEMENTARY ANATOMY AND PHYSIOLOGY FOR NURSES; By H. Clifford Barclay, M.D., Ch.B., M.R.C.S., etc. 3d ed. New York: William Wood and Company, 1924.

THE TECHNIQUE OF LOCAL ANESTHESIA. By Arthur E. Hertzler, A.M., M.D., Ph.D., LL.D., F.A.C.S. 3d ed. St. Louis: The C. V. Mosby Company, 1925.

THE ELECTRO-CHEMICAL FACTOR IN NEUROLOGY. By Earnest H. Pasque. Detroit, Michigan: The Atomic Research Association, 1925.

A SYNOPSIS OF GYNÆCOLOGY. By Arthur Gray, F.R.S.C., M.B.C.P. London: Edward Arnold & Co., 1925.

HANDBOOK OF OPERATIVE SURGERY. Sir William Ireland de C. Wheeler (Mod.), B.A., M.D. (Dub. Univ.), F.R.C.S. 4th ed. New York: William Wood and Company, 1925.

ON THE BREAST. By Duncan C. L. Fitzwilliams, C.M.G., M.D., Ch.M., F.R.C.S. (Edin. and Eng.) St. Louis: C. V. Mosby Company, 1924.

MEDICAL EDUCATION. By Abraham Flexner. New York: The MacMillan Company, 1925.

MORTALITY STATISTICS, 1922. Twenty-Third Annual Report. Department of Commerce Bureau of the Census. Washington: Government Printing Office, 1925.

PRATIQUE COURANTE AND CHIRURGIE D'URGENCE. By V. Veau and F. D'Allaines. 7th ed. Paris: Masson and Co., 1924.

CHIRURGIE DE L'APPAREIL URINAIRE ET DE L'APPAREIL GÉNITAL DE L'HOMME. By Pierre Duval and J. Gatellier. 6th ed. entirely revised. Paris: Masson and Co., 1924.

SURGERY OF THE EYE; FOR STUDENTS AND PRACTITIONERS. By Ervin Török, M.D., and Gerald H. Grout, M.D. Philadelphia and New York: Lea & Febiger, 1925.

MODERN SURGERY; GENERAL AND OPERATIVE. By John Chalmers DaCosta, M.D., LL.D., F.A.C.S. Philadelphia and London: W. B. Saunders Company, 1925.

PEDIATRICS. By various Authors. Edited by Isaac A. Abt, M.D. vol. vii. Philadelphia and London: W. B. Saunders Company, 1925.

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION. vol. xvi, 1924. Edited by Mrs. M. H. Mellish. Philadelphia and London: W. B. Saunders Company, 1925.

GYNAEKOLOGISCHE OPERATIONEN. By Karl Franz. Berlin: Julius Springer, 1925.

SIMPLIFIED NURSING. By Florence Dakin, R. N. Philadelphia: J. B. Lippincott Company, 1925.

AN INTRODUCTION TO SEXUAL PHYSIOLOGY. By F. H. A. Marshall, F.R.S. New York: Longmans, Green and Co., 1925.

THE MEDICAL WHO'S WHO. 7th ed. Grafton Publishing Company Ltd., 1925.

PNEUMONIA. By the late R. Murray Leslie, M.A., B.Sc., M.D. Edited by J. Browning Alexander, M.D., M.R.C.P. (Lond.) London: William Heinemann, 1925.

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PRELIMINARY PROGRAM FOR THE PHILADELPHIA MEETING

THE program for the fifteenth annual session of the Clinical Congress of the American College of Surgeons, to be held in Philadelphia October 26 to 30, as published in the following pages is merely an outline of the program being prepared by the Committee on Arrangements. During the coming months the program is to be revised and greatly amplified under the supervision of the Committee on Arrangements so that the final program will represent completely the clinical activities in all departments of surgery in that great medical center.

An important feature of the program will be a series of demonstrations or "dry clinics" at the larger hospitals in which the surgeons, internists, pathologists, roentgenologists and other specialists will participate to discuss some of the more important phases of surgery.

Another series of clinical demonstrations, dealing with surgical aspects of ophthalmology, otology, rhinology, and laryngology, will be given each forenoon in the Ballroom of the Bellevue-Stratford to supplement the clinical work in the hospitals in the afternoons. Thus a full program of clinical work will be provided for each of the four days of the session for those who are interested in surgery of the eye, ear, nose, and throat.

General headquarters of the Congress will be established at the Bellevue-Stratford Hotel, Broad and Walnut Streets, where the entire first floor, including the Ballroom, Clover Room, Rose Room, Gold Room, together with the Stratford Room on the main floor and the Rose Garden and other rooms on the roof, have been reserved for the exclusive use of the Congress. These rooms provide ample space for evening meetings, business sessions, hospital standardization headquarters, registration and ticket bureaus, bulletin rooms, etc.

A number of fine large hotels, situated within easy walking distance of the Bellevue-Stratford,

have been erected since the last meeting in 1921, so that the hotel situation in Philadelphia has been greatly improved. See list of hotels with their rates on another page.

An application for reduced railway fares on account of the meeting in Philadelphia is pending with the railway passenger associations and it seems assured that a substantial reduction in fares will be granted applying to all sections of the United States and Canada.

EVENING MEETINGS

Monday—Ballroom, 8: Presidential meeting, inaugural address by Dr. Rudolph Matas of New Orleans; John B. Murphy Oration in Surgery.

Tuesday—Ballroom, 8: Scientific papers and discussions, general surgery, etc.

Rose Garden, 8: Scientific papers, section on surgery of the eye, ear, nose, and throat.

Wednesday—Ballroom, 8: Scientific papers and discussions, general surgery, etc.

Rose Garden, 8: Scientific papers, section on surgery of the eye, ear, nose, and throat.

Thursday—Ballroom, 8: Scientific papers and discussions, general surgery, etc.

Rose Garden, 8: Scientific papers section on surgery of the eye ear, nose, and throat.

Friday—Ballroom, 8: Thirteenth convocation of the American College of Surgeons; Fellowship Address.

HOSPITAL CONFERENCE

An interesting and instructive program has been prepared for the hospital conference during the first two days of the Congress. The program, consisting of addresses, papers, and discussions dealing with the various aspects of hospital work as related to the hospital standardization movement, will be of particular interest to surgeons, hospital trustees, executives, and personnel generally.

The tentative program for the conference includes the following: Eighth annual report on hospital standardization with a list of hospitals meeting the minimum requirements of the College; responsibility of Fellows of the College as to hospital standardization; the hospital, the doctor, and the nurse as co-operative factors in the care of the patient; the eminent hospital; application of College standards in the modern hospital; the hospital of the future; what the College can do for the smaller hospital; postmortems in hospitals; findings in the State of Pennsylvania survey; relation of the surgeon to postmortems; postmortems in the open hospital; end-results and follow-ups; essentials for an efficient fracture service; collection and publication of surgical statistics.

Two round table conferences are provided for, conducted by Dr. Joseph C. Doane, medical director and superintendent of the Philadelphia General Hospital, and Dr. John D. Spelman, superintendent of Touro Infirmary, New Orleans. These conferences will deal with problems related to hospital administration from the standpoint of organization, facilities, personnel, procedure, and end-results. The subjects to be discussed have been selected after a recent careful survey of the hospital field.

A hospital information and service bureau will be maintained throughout the Congress to give assistance to any hospital in the solution of its problems. A general invitation is extended to hospital trustees, members of the medical and surgical staffs and hospital personnel generally to attend the conference.

LIMITED ATTENDANCE

Attendance at the Philadelphia session will be limited to a number that can be comfortably accommodated at the clinics, the limit of attendance being based upon the result of a survey of the amphitheaters, operating rooms, and laboratories in the hospitals and medical schools as to their capacity for accommodating visitors. Thfs plan necessitates registration in advance on the part of all who wish to attend. When the limit of attendance has been reached through advanced registration, no further applications can be accepted.

Attendance at clinics and demonstrations will be controlled by means of special clinic tickets, which plan has proved an efficient means in the past for providing for the distribution of visiting surgeons among the several clinics and insures against overcrowding, as the number of tickets issued for any clinic is limited to the capacity of the room in which that clinic is given.

REGISTRATION FEE

A registration fee of $5.00 is required of each surgeon attending the annual clinical meeting, such fees providing the funds with which to meet the expenses of the meeting. To each surgeon registering in advance a formal receipt for the registration fee is issued, which receipt is to be exchanged for a general admission card upon his registration at headquarters during the meeting. This card, which is nontransferable, must be presented to secure clinic tickets and admission to the evening meeting.

GENERAL SURGERY, GYNECOLOGY, OBSTETRICS ORTHOPEDICS, UROLOGY

JEFFERSON HOSPITAL

Tuesday

J. Torrance Rugh—9:30. Orthopedics.
Charles F. Nassau—11. General surgery.
Thomas C. Stelwagen—11. Genito-urinary surgery.
John H. Gibbon—2. General surgery.

Wednesday

Chevalier Jackson—9. Bronchoscopy for diagnosis and treatment of diseases of the lungs.
Brooke M. Anspach and Staff—9. Gynecology.
P. Brooke Bland—9. Gynecology.
W. H. Kinney—11. Genito-urinary surgery.
John B. Flick—11. General surgery.
J. Chalmers DaCosta—2. Surgical clinic.

Thursday

H. R. Loux—9. Genito-urinary surgery.
J. M. Fisher—11. Gynecology.
Thomas A. Shallow—11. General surgery.
Arthur Davidson—11. Orthopedic surgery.
Chevalier Jackson, Gabriel Tucker, and Louis Clerf—12:30. Bronchoscopic aspiration in suppurative diseases of the lung.

Friday

Edward J. Klopp—11. General surgery.

EPISCOPAL HOSPITAL

Tuesday

Ralph S. Bromer—9. X-ray demonstration.
Louis H. Mutschler—11. Operative clinic, general surgery

Wednesday

Astley P. C. Ashhurst, Irvine M. Boykin, and Edward T. Crossan—9. Operative clinic, general surgery.
A. Bruce Gill, Rutherford L. John, and Albert F. Moxey—2. Orthopedics.

Thursday

E. G. Alexander—9. Operative clinic, general surgery.
H. C. Deaver—11. Operative clinic, general surgery.

Friday

E. T. Crossan—9. Demonstration in surgical pathology.
L. H. Mutschler—11. Operative clinic, general surgery.
John B. Haines—2. Cystoscopic clinic.

ORTHOPEDIC HOSPITAL

Tuesday

Astley P. C. Ashhurst, Rutherford L. John, Edward T. Crossan, and B. F. Buzby—1. Orthopedic demonstration.

Thursday

Astley P. C. Ashhurst, Rutherford L. John, Edward T. Crossan, and B. F. Buzby—9. Orthopedic operations.

Friday

A. Bruce Gill, C. R. Bowen, and James E. Wyant. Orthopedic clinic.

METHODIST EPISCOPAL HOSPITAL

Tuesday

James H. Baldwin—9. Gas gangrene, foreign body in bladder, fractures of patella, foreign body in brain.
Milton F. Percival—9. Daily demonstrations of X-ray technique, fluoroscopy, pyelograms, electrocoagulation, radio knife, and photography.

Wednesday

William R. Nicholson—9. Vesicovaginal fistula, cystocele, prolapse of uterus, cervical repairs and repairs of perineum.
Levi Jay Hammond—2. Surgery of gall tracts, stomach, spleen, and pancreas.

Thursday

Damon B. Pfeiffer—9. Carcinoma of the rectosigmoid, blood transfusions, surgery of the gall bladder, stomach, and intestines.
Richard C. Norris—2. Abdominal gynecology, retroversion, uterine and ovarian tumors, cæsarean section.

Friday

J. T. Rugh—9. Arthrodesis, correction of paralytic deformities, stabilization of the hip joint and spinal bone grafts.
Leon Herman—1. Prostatectomy, renal calculus, hypernephroma, malignant tumors of the bladder, cystoscopy, and pyelography.

ST. MARY'S HOSPITAL

Tuesday

James A. Kelly—9. General surgery.
William J. Ryan—9. General surgery.
Wilbur H. Haines and L. F. Milliken—2. Genito-urinary clinic.
W. T. Rees. Laboratory demonstration.

Wednesday

William A. Steel—9. Abdominal surgery with spinal anæsthesia.
A. P. Keegan—9. General surgery and local anæsthesia.
C. Howard Moore—2. Orthopedic clinic, operations and demonstration of cases.
W. T. Rees. Laboratory demonstration.

Thursday

Frank D. Harris—9. Gynecology.
William F. Morrison—9. Gynecology.
William E. Parke and J. Stuart Lawrence—12:30. Obstetrical clinic, labor room and ward walks. Operations. Prenatal clinic.
W. T. Rees. Laboratory demonstration.

MEDICO-CHIRURGICAL HOSPITAL

Tuesday

J. B. Carnett—9. General surgery.
George M. Boyd—11. Gynecology.

Wednesday

George W. Outerbridge—9. Cystoscopy.
William R. Nicholson—9. Gynecology.

Friday

J. B. Carnett—9. General surgery.
George M. Boyd—11. Gynecology.

PENNSYLVANIA HOSPITAL

Tuesday

CHARLES F. MITCHELL, W. ESTELL LEE, HENRY P. BROWN, and LEON HERMAN—11. General surgery.

Wednesday

JOHN H. GIBBON, ARTHUR E. BILLINGS, EDWARD J. KLOPP, JOHN B. FLICK, and LEON HERMAN—11. General surgery.

Thursday

JAMES CAMERON—9. Oral surgery.
J. R. PAUL—10. Surgical pathology.
CHARLES F. MITCHELL, W. ESTELL LEE, HENRY P. BROWN, and LEON HERMAN—11. General surgery.

POLYCLINIC HOSPITAL

Tuesday

DEFOREST P. WILLARD—10:30. Orthopedics.
G. E. PFAHLER—2. Radiologic conference.
B. A. THOMAS—2. Urology.

Wednesday

R. H. IVY and LAWRENCE CURTIS—10. Oral surgery.
W. G. ELMER—11:30. Orthopedic surgery.

Thursday

COLLIER F. MARTIN—1. Proctology.
J. F. SCHAMBERG—2. Arsphenamin clinic.

Friday

R. H. IVY—9. Maxillofacial surgery.
B. A. THOMAS—2. Urology.
E. A. CASE—2. Surgical pathology.

ST. AGNES HOSPITAL

Tuesday

E. C. MURPHY—9. Dry clinic: Exhibition of fracture cases with end-results by operative and non-operative procedures.
JOHN F. X. JONES—9. General surgery, operative clinic.
JOHN A. MCGLINN—9. Gynecology. Exhibition of patients treated for acute inflammatory diseases by means of nonspecific proteins. Demonstration of method of treatment of gonorrhœa in the female by heat.

Wednesday

G. M. DORRANCE and J. W. BRANSFIELD—9. Operative clinic and demonstration of cases. Cleft palate cases operated on by the new method, elongation of palate.
JOHN M. FISHER—9. Gynecology.
WILBUR B. HAINES—2. Genito-urinary surgery.
J. C. HIRST and staff—2. Gynecology and obstetrics.

NORTHEASTERN HOSPITAL

Wednesday

H. Z. HIRSHMAN—9. Anorectal infections.
T. TURNER THOMAS—10. General surgery.
JOHN B. LOWNES and J. A. BROADFIELD—3. Operative and cystoscopic clinic.

Thursday

T. TURNER THOMAS—2. Dry clinic: Results with non-operative reduction, especially of wrist, elbow, shoulder, hip, and ankle. Operative reductions. Compound fractures. Recurrent dislocations of shoulder. Brachial birth palsy.

UNIVERSITY HOSPITAL

Tuesday

JOHN G. CLARK, C. C. NORRIS, and F. E. KEENE—9. Gynecology.
C. H. FRAZIER, F. GRANT, and TEMPLE FAY—9. Neurosurgery.
B. C. HIRST, E. B. PIPER, J. C. HIRST, II, J. K. JAFFE, G. V. JANVIER, and W. BENSON HARER—9. Obstetrics and gynecology.
GEORGE P. MULLER and I. S. RAVDIN—9. General surgery.
A. BRUCE GILL—9. Orthopedics.
CHEVALIER JACKSON and GABRIEL TUCKER—3. Bronchoscopy.

Wednesday

JOHN G. CLARK, C. C. NORRIS, and F. E. KEENE—9. Gynecology.
E. L. ELIASON and DRURY HINTON—9. General surgery.
A. RANDALL, S. W. MOORHEAD, P. S. PELOUZE, and MAURICE MUSCHAT—2. Urology.

Thursday

JOHN G. CLARK, C. C. NORRIS, and F. E. KEENE—9. Gynecology.
C. H. FRAZIER, F. GRANT, and TEMPLE FAY—9. Neurosurgery.
B. C. HIRST, E. B. PIPER, J. C. HIRST, II, J. K. JAFFE, G. V. JANVIER, and W. B. HARER—9. Obstetrics and gynecology.
G. P. MULLER and I. S. RAVDIN—9. General surgery.
A. BRUCE GILL—9. Orthopedics.
CHEVALIER JACKSON and GABRIEL TUCKER—3. Bronchoscopy.

Friday

JOHN G. CLARK, C. C. NORRIS, and F. E. KEENE—9. Gynecology.
C. H. FRAZIER, F. GRANT, and TEMPLE FAY—9. Neurosurgery.
B. C. HIRST, E. B. PIPER, J. C. HIRST, II, J. K. JAFFE, G. V. JANVIER, and W. B. HARER—9. Gynecology and obstetrics.
E. L. ELIASON and DRURY HINTON—9. General surgery.
A. BRUCE GILL—9. Orthopedics.

CHESTNUT HILL HOSPITAL

Tuesday

ANDREW GODFREY and WILLIAM SHEEHAN—10. General surgery.
ALEXANDER RANDALL—2. Urology.

Wednesday

J. MURRAY ELLZEY—10. Fracture clinic.

Thursday

J. F. MCCLOSKEY—10. General surgery.

KENSINGTON HOSPITAL FOR WOMEN

Tuesday

WILLIAM E. PARKE—11. Prenatal clinic, history taking, pelvimetry, blood-pressure records, obstetrical analgesia.
H. C. DEAVER—12:30. General surgical clinic.

Friday

DANIEL LONGAKER—11. Potter version statistics and demonstration of available material.

PHILADELPHIA GENERAL HOSPITAL

Tuesday

FRANK C. HAMMOND—10. Gynecological operations.
WILLIAM H. MACKINNEY—2. Genito-urinary operations.

Wednesday

ALFRED C. WOOD—9. General surgery.
J. T. RUGH—11. Orthopedic surgery.
STAFF—2. Symposium on Cancer: J. B. CARNETT, general surgery; HENRY K. PANCOAST, radiology; C. C. NORRIS, gynecology; J. F. SCHAMBERG, dermatology; ROBERT G. TORREY, medical; GEORGE M. DORRANCE, faciomaxillary; F. O. LEWIS, laryngology. Visit to radium emanation plant and deep therapy laboratories.

Thursday

J. B. CARNETT, J. RALSTON WELLS, ROBERT BRADLEY and JAMES P. WEATHERWAX—9. Nonoperative cancer clinic.
EDWARD A. SCHUMANN—2. Gynecological operations.

Friday

T. T. THOMAS—9. General surgery.
C. C. NORRIS—11. Gynecological clinic, cancer operations.
EDWARD B. KRUMBHAAR and staff of pathologists—4. Clinicopathological conference, demonstrating current interesting pathological conditions and specimens. Open discussion is invited at this conference.

MISERICORDIA HOSPITAL

Tuesday

BASIL BELTRAN and staff—9. General surgery.
JAMES A. KELLY and staff—9. General surgery.

Wednesday

GEORGE P. MULLER and THOMAS RYAN—9. General surgery
PETER M. KEATING—9. Clinical demonstration.
J. F. X. JONES—2. General surgery.

Thursday

BASIL BELTRAN and staff—9. General surgery.
JAMES A. KELLY and staff—9. General surgery.

Friday

GEORGE P. MULLER and THOMAS RYAN—9. General surgery
PETER M. KEATING—9. Clinical demonstration.
J. F. X. JONES—2. General surgery.

NORTHWESTERN GENERAL HOSPITAL

Tuesday

J. O. ARNOLD—2. Obstetrical clinic. Perineotomy, an improved technique

Wednesday

J. T. SCHELL—9. General surgery

Thursday

ARTHUR D. KURTZ—3:30. Orthopedic dry clinic.

Friday

ROBERT BOYER—11. Genito-urinary clinic. Suprapubic prostatectomy.

LANKENAU HOSPITAL

Tuesday

STANLEY P. REIMAN—9. Demonstrations in new laboratory.
A. G. MILLER, and ROBERT SHOEMAKER—11. Demonstration in roentgenology.
F. L. HARTMAN—11. Demonstration of follow-up system.

Wednesday

STANLEY P. REIMAN—9. Demonstration in new laboratory.
F. L. HARTMAN—11. Demonstration of follow-up system.
A. G. MILLER and ROBERT SHOEMAKER—11. Demonstration in roentgenology.
JOHN B. DEAVER—12. General surgery.

Thursday

F. L. HARTMAN—11. Demonstration of follow-up system.
A. G. MILLER and ROBERT SHOEMAKER—11. Demonstration in roentgenology.
JOHN B. DEAVER—12. General surgery.
WILLIAM H. MACKINNEY—5:30. Cystoscopy.

Friday

STANLEY P. REIMAN—9. Demonstration in new laboratory.
A. G. MILLER and ROBERT SHOEMAKER—11. Demonstration in roentgenology.
F. L. HARTMAN—11. Demonstration of follow-up system.

ST. JOSEPH'S HOSPITAL

Tuesday

JOSEPH M. SPELLISSY—9. Dry clinic: Operative mechanical treatment of some of the effects of infantile paralysis.
JOHN F. X. JONES—11. General surgery; appendectomy, gall-bladder disease.

Wednesday

MELVIN M. FRANKLIN—9. General surgery; influence of prosthetics upon amputations; chronic, nontuberculous suppuration in bone.
F. HURST MAIER—11. Gynecology; hysterectomy for myofibromata, plastic for procidentia, suspension for retroflexion.

Thursday

JAMES A. KELLY—9. General surgery; fracture clinic.

Friday

CHARLES F. NASSAU—9. General surgery; subtotal thyroidectomy under local anæsthesia, hernioplasty under local anæsthesia.
P. BROOKE BLAND—11. Gynecology; application of radium for uterine myofibromata, trachelorrhaphy and perineorrhaphy, abdominal hysterectomy.

WOMAN'S COLLEGE HOSPITAL

Tuesday

LIDA STEWART-COGILL—9. Prenatal clinic.

Wednesday

J. S. RODMAN and STAFF—9. General surgery.

Thursday

CATHARINE MACFARLANE—2. Gynecology.

Friday

J. S. RODMAN and staff—9. General surgery.

HAHNEMANN HOSPITAL

Tuesday

L. T. Ashcraft, William C. Hunsicker, Frank C. Benson, Jr.—9. Urologic clinic. Symposium on tumors of the urinary bladder and on carcinoma of the prostate. Demonstration of local anæsthesia.

J. E. James, Jr. and Leon Clemmer—10. Obstetrical clinic. Salient points in pelvimetry. The rôle of version in obstetrical surgery. Cervico-abdominal hysterectomy.

F. W. Smith—2. Bronchoscopic work on the cadaver.

F. C. Benson, Jr.—3. Radium clinic. Technique of application and results in superficial malignant tumors. Limitations, contra-indications, and dangers in radium therapy.

Wednesday

H. L. Northrop—9. Thoracic surgery.

D. B. James and E. B. Craig—9. Gynecological clinic. Malignancy of the uterus.

W. C. Mercer and J. B. Bert—10. Obstetrical clinic. Forceps application with special reference to the cephalic application in posterior oblique positions. The mechanism of labor.

S. W. Sappington—3. Demonstration of various methods of blood transfusion.

Thursday

J. D. Elliott and William M. Sylvis—9. Operative clinic. Tumors of the breast. Discussion of the pathology and end-results of treatment by X-rays, radium, and operation.

D. B. James—9. Gynecological clinic.

O. B. Waite and N. F. Paxson—10. Obstetrical clinic. Prenatal care. Practical results of routine Wassermann tests. Pre-eclampsia and eclampsia. Fetal mortality.

J. A. Brooke—2. Orthopedic clinic. Shortening of bones of the leg to correct inequality in length. Demonstration of new bone skid. Results of astragalectomy in paralytic foot.

J. W. Frank—3. Roentgenologic clinic. Comparison of newer forms of roentgen treatment for malignancy with former methods. Presentation of patients.

Friday

G. A. Van Lennep and H. P. Leopold—9. Surgery of the stomach and duodenum.

N. F. Lane and D. W. Culin—9. Uterine bleeding, diagnosis and treatment.

SAMARITAN HOSPITAL

Tuesday

John Leedom, J. O. Bower, G. Mason Astley, John C. Frick, and J. N. Coombs—9. Surgical clinic.

Harry Hudson—2. Orthopedic clinic.

Albert Strickler—3. Dermatology.

Wednesday

W. Wayne Babcock—9. General surgery.

Charles S. Barnes and C. M. Stimson—11. Obstetrics.

Frank C. Hammond—2. Gynecology.

W. Hershey Thomas—4. Genito-urinary surgery.

Harry Z. Hibshman—5. Rectal clinic.

Thursday

A. C. Applegate—11. Obstetrics.

Friday

W. Wayne Babcock—9. General surgery.

CHILDREN'S HOSPITAL

Tuesday

J. H. Jopson—9. Diagnosis in surgical diseases of the abdomen.

J. C. Gittings—9. Some medical aspects of surgical cases.

C. W. Burr and F. E. Leavitt—9. Neurosurgical problems in children.

C. C. Norris—2. Vaginitis in infants and young children; methods of treatment.

Wednesday

W. Estell Lee and J. R. Wells—9. Problems in thoracic surgery. Treatment of burns.

R. S. Bromer—9. X-ray in thoracic and gastro-intestinal lesions.

Thursday

Howard C. Carpenter—9. Health examination in children.

Emily P. Bacon—9. Demonstration of nutritional work in children.

Susan C. Francis, R. N.—9. Problems in management of surgical wards.

Friday

John Speese and W. Edgar Christie—9. Postoperative management of surgical cases.

Henry P. Brown and Ernest G. Williamson—9. Management of the surgical out-patient department.

MT. SINAI HOSPITAL

Tuesday

Charles F. Nassau—9. Radical cure of hernia, local anæsthesia.

G. Rosenbaum—12. X-rays of gastro-intestinal tract.

Wednesday

M. Behrend—9. Surgery of bile passageways and gastro-intestinal tract. Presentation of cases.

M. Cooperman—2. Gonorrhœal arthritis, dislocation of hip, astragalectomy, Whitman reconstruction operation.

G. Tucker—4. Bronchoscopy and œsophagoscopy.

Thursday

J. C. Hirst—9. Prolapse of uterus, cystoscopy, vaginal repair.

G. Rosenbaum—12. X-rays of gastro-intestinal tract.

G. Tucker—4. Bronchoscopy and œsophagoscopy.

Friday

C. Mazer—9. Plastic, Rubin test, and pyelography.

C. Hirsh—11:30. Demonstration of cases.

FRANKFORD HOSPITAL

Wednesday

W. E. Parke—9:30. Plastics, plastic and retroversion of uterus.

E. A. Schumann—9:30. Fibroid of uterus, carcinoma of uterus, plastic and section.

G. C. Hanna—9:30. Cæsarian section.

F. E. Keller—9:30. Cæsarian section, local anæsthesia.

Thursday

Charles F. Nassau—9:30. Cholelithiasis, duodenal ulcer, nephrolithiasis, goiter.

Louis D. Englerth—9:30. Hernia under local anæsthesia fracture clinic.

WOMAN'S HOSPITAL

Tuesday

SARAH H. LOCKREY and EMILY WHITTEN-AUGE—9. Gynecology.
LIDA STEWART-COGILL and ELIZABETH HUGHES—2. Obstetrics.
JULIA HARDIN. Gas-oxygen and ethylene anæsthesia.

Wednesday

MARIE K. FORMAD and ALBERTA PELTZ—9. Gynecology.
ELLA WILLIAMS GRIM and ALBERTA PELTZ—3. Obstetrics.
JULIA HARDIN. Gas-oxygen and ethylene anæsthesia.

Thursday

CATHARINE MACFARLANE and FAITH S. FETTERMAN—9. Gynecology.
MARY LEWIS and DELLA MILDAZIAS—3. Obstetrics.
JULIA HARDIN. Gas-oxygen and ethylene anæsthesia.

Friday

KATE W. BALDWIN—9. General surgery.
ELIZABETH F. C. CLARK—11. Gynecology.
ANN TOMKINS GIBSON and JESSIE W. PRYOR—2. Obstetrics.
EMILY WHITTEN-AUGE—3. General surgery.
JULIA HARDIN. Gas-oxygen and ethylene anæsthesia.

STETSON HOSPITAL

Tuesday

JOHN A. BOGER and WILLIAM T. ELLIS—1. General surgery.

Wednesday

S. E. TRACY and Associates—9. Gynecology.

Thursday

BROOKE M. ANSPACH and Associates—9. Gynecology.

Friday

S. E. TRACY and Associates—9. Gynecology.
CARL F. KOENIG—1. Roentgenology.

CHILDREN'S HOMEOPATHIC HOSPITAL

Tuesday

H. P. LEOPOLD—2. General surgery.

Wednesday

JOHN BROOKE—2. Orthopedic clinic: After-results in epiphyseal fractures; club hand; syphilitic joints; joint changes in endocrine disturbances.

Thursday

A. KORNDOERFER, JR.—2. Obstetrical clinic.

AMERICAN ONCOLOGIC HOSPITAL

Tuesday

W. S. NEWCOMET—10. Cases of angioma, treated and under treatment, selected from a group of 200.
SAMUEL MCCLARY, 3rd.—10. Cases of cancer of the lip and mouth.

ST. CHRISTOPHER'S HOSPITAL

Tuesday

E. G. ALEXANDER—10. Surgical clinic: hernia, appendix, pyloric stenosis, undescended testicle, hare lip, empyema and bone cases. Surgery in children.

HOWARD HOSPITAL

Tuesday

A. C. WOOD—9. General surgery.
E. L. ELIASON, DRURY HINTON, and V. W. M. WRIGHT—10:30. General surgery. Industrial surgery clinic. Outline of system of records, follow-up. Routine surgery.

Wednesday

B. C. HIRST—9. Gynecology.

Thursday

A. C. WOOD—9. General surgery.
E. L. ELIASON, DRURY HINTON, and V. W. M. WRIGHT—10:30. Fracture clinic, methods and results.
E. L. ELIASON—11. Routine surgery under local anæsthesia.
S. W. MOORHEAD—4. Genito-urinary clinic.

Friday

B. C. HIRST—9. Gynecology.

PRESBYTERIAN HOSPITAL

J. H. JOPSON, JOHN SPEESE, D. B. PFEIFFER, J. S. RODMAN, and HENRY P. BROWN, JR. General surgery.
JOHN H. GIRVIN, GEORGE M. LAWS, and PHILIP WILLIAMS. Gynecology.
B. A. THOMAS and staff. Genito-urinary surgery.
A. BRUCE GILL and T. E. ORR. Orthopedic surgery.
FRANK CROZER KNOWLES and HENRY G. MUNSON. Dermatology.
JOHN A. EIMAN and W. EDGAR CHRISTIE; JOHN H. GIRVIN and staff; B. A. THOMAS and F. G. HARRISON. Surgical and special pathology.
WILLIAM S. NEWCOMET. Roentgenology.
Operative clinics daily at 9. Demonstrations and pathological exhibits in new out-patient and laboratory building at 2:30.

JEWISH HOSPITAL

Tuesday

M. BEHREND—9. General surgery.
W. H. TELLER—2. General surgery.

Wednesday

F. B. BLOCK—9. General surgery.
L. Brinkman—2. General surgery.

Thursday

M. BEHREND—9. General surgery.
F. B. BLOCK—2. General surgery.

Friday

L. BRINKMAN—9. General surgery.
W. H. TELLER—2. General surgery.

WOMEN'S HOMEOPATHIC HOSPITAL

Tuesday

JOHN A. BROOKE—2. Orthopedics.

Wednesday

ARTHUR HARTLEY—2. General surgery.

Friday

FRANCOIS L. HUGHES—10. Gynecology.

COOPER HOSPITAL (Camden)

Tuesday

THOMAS B. LEE, ALBERT B. DAVIS, and GORDON WEST—9. Gynecology.

Wednesday

PAUL M. MECRAY and Associates—10. General surgery.
A. HAINES LIPPINCOTT and DAVID BENTLEY, JR.—2:30. Genito-urinary and rectal clinic.
B. F. BUZBY—2:30. Orthopedic clinic.

Thursday

THOMAS B. LEE, ALBERT B. DAVIS, and GORDON WEST—9. Gynecology.

Friday

PAUL M. MECRAY and Associates—10. General surgery.
B. F. BUZBY—2:30. Orthopedics.

ST. LUKE'S HOSPITAL

Tuesday

DESIDERIO ROMAN—9. General surgery.
O. F. BARTHMAIER—11. Demonstration of blood transfusion.

Wednesday

A. B. WEBSTER—9. General surgery.
J. WALTER POST—11. Demonstration in roentgenology.

Thursday

DESIDERIO ROMAN—9. Operations upon thyroid and demonstration of group study of thyroid disease.

Friday

A. B. WEBSTER—9. General surgery.
J. WALTER POST—11. Demonstration in roentgenology.

SURGERY OF THE EYE, EAR, NOSE AND THROAT

CLINICAL DEMONSTRATIONS

In the Ballroom, Bellevue-Stratford

Tuesday—9 A.M.

BEN WITT KEY, New York City: Foreign protein therapy, experimental and clinical.

JOSEPH C. BECK, Chicago: Management of some of the important complications from ear, nose, and throat diseases and operations.

WELLS P. EAGLETON, Newark, N. J.: Meningitis of aural origin.

Wednesday—9 A.M.

CHEVALIER JACKSON, Philadelphia: Laryngofissure for cancer of the larynx.

HARRY S. GRADLE, Chicago: Practical use of the slit lamp in daily routine.

DOUGLAS QUICK, New York City: Use of radium and X-ray in the treatment of malignant disease of the paranasal sinuses.

JOHN E. MACKENTY, New York City: Laryngectomy in one stage, comments on one hundred operations.

Thursday—9 A.M.

PROFESSOR F. NAGER, Zurich, Switzerland: Otology.

E. C. ELLETT, Memphis, Tenn.: Use of the suture in cataract extraction.

GEORGE E. SHAMBAUGH, Chicago: Otology.

T. E. CARMODY, Denver, Colo.: Observations on children's sinuses in health and diseases.

Friday—9 A.M.

MAJOR EDMUND B. SPAETH, Takoma Park, Md.: Ophthalmic plastic surgery, illustrated with lantern slides.

GEORGE M. DORRANCE, Philadelphia: Rhinoplasty, presentation of cases, lantern slide demonstration.

WARREN B. DAVIS, Philadelphia: Some types of harelip and cleft palate deformities and their operative results.

EPISCOPAL HOSPITAL

Tuesday

W. R. WATSON, EDWARD W. COLLINS, and OTTO C. HIRST—2. Otolaryngology.
HAROLD G. GOLDBERG, DAVID J. BOONE, and WILLIAM H. CHANDLEE—2. Ophthalmology.

Wednesday

A. G. FEWELL, WARREN S. REESE, J. B. RUDOLPHY, and FRED HERBERT, JR.—2. Ophthalmology.
W. R. WATSON and associates—2. Otolaryngology.

Thursday

FREDERICK KRAUSS and J. B. FELDMAN—2. Ophthalmology.
CHARLES C. BIEDERT, THOMAS R. CURRIE, and WILLIAM MATTHEWS—2. Otolaryngology.

Friday

CHARLES C. BIEDERT and associates—2. Otolaryngology.
HAROLD G. GOLDBERG and associates—2. Ophthalmology.

HOWARD HOSPITAL

Tuesday

G. B. WOOD—2. Laryngology.

Wednesday

W. C. POSEY—2. Ophthalmology; varied eye operations.

Thursday

G. B. WOOD—2. Laryngology.

Friday

W. C. POSEY—2. Ophthalmology.

ST. MARY'S HOSPITAL

Tuesday

FRANK MURPHY—2. Eye clinic.

Wednesday

EDWARD MURPHY, WILLIAM P. GRADY, and ALBERT J. DEVLIN—3. Otolaryngology.

WILLS EYE HOSPITAL

Tuesday

BURTON CHANCE, FRANK C. PARKER, LEIGHTON F. APPLEMAN, and BENJAMIN F. BAER, JR.—2. Ophthalmic operations.

Wednesday

WILLIAM ZENTMAYER, PAUL J. PONTIUS, J. MILTON GRISCOM, and THOMAS A. O'BRIEN—2. Ophthalmic operations.

Thursday

BURTON CHANCE, FRANK C. PARKER, LEIGHTON F. APPLEMAN, and BENJAMIN F. BAER, JR.—2. Ophthalmic operations.

Friday

WILLIAM ZENTMAYER, PAUL J. PONTIUS, J. MILTON GRISCOM and THOMAS A. O'BRIEN—2. Ophthalmic operations.

ST. JOSEPH'S HOSPITAL

Tuesday

GEORGE M. MARSHALL—2. Otolaryngology; osteoplastic correction of the nasal bones, radical maxillary sinus operation.

PAUL J. PONTIUS—2. Ophthalmology; enucleation with gold ball insertion, iridectomy.

Wednesday

CHARLES J. JONES—2. Ophthalmology; preliminary iridectomy for cataract, simple extraction.

WILLIAM E. QUICKSALL—2. Otolaryngology; tonsillectomy by Fetterolf's method, submucous resection.

Thursday

THOMAS A. O'BRIEN—2. Ophthalmology; combined extraction, Elliott trephine for glaucoma.

ARTHUR WRIGLEY—2. Otolaryngology; replacement of laterally displaced tip of quadrangular cartilage with submucous resection, tonsillectomy by decapsulation with dissection and snare.

CORNELIUS T. MCCARTHY—2. Otolaryngology; radical mastoidectomy, ethmoidectomy.

MEDICO-CHIRURGICAL HOSPITAL

Tuesday

GEORGE M. COATES—2. Otolaryngology.

Wednesday

ROSS H. SKILLERN—2. Laryngology.

Thursday

GEORGE M. COATES—2. Otolaryngology.

Friday

ROSS H. SKILLERN—2. Laryngology.

WOMAN'S COLLEGE HOSPITAL

Tuesday

MARGARET F. BUTLER—2. Otolaryngology.

Friday

MARY BUCHANAN—3. Ophthalmology.

JEWISH HOSPITAL

Wednesday

J. KNIPE—3. Eye clinic.

Thursday

S. MCC. SMITH and A. S. KAUFMAN—3. Otological clinic.

H. M. GODDARD—4. Nose and throat clinic.

FRANKFORD HOSPITAL

Tuesday

FRANK EMBERY—9:30. Tonsil and mastoid clinic.

W. J. WATSON—9:30. Tonsil clinic.

UNIVERSITY HOSPITAL

Tuesday

THOMAS B. HOLLOWAY—2. Ophthalmology

G. FETTEROLF, J. A. BABBITT, D. HUSIK, and LEWIS FISHER—3. Otolaryngology.

Wednesday

G. FETTEROLF, J. A. BABBITT, D. HUSIK, and L. FISHER—3. Otolaryngology.

Thursday

THOMAS B. HOLLOWAY—2. Ophthalmology.

Friday

THOMAS B. HOLLOWAY—2. Ophthalmology.

GEORGE FETTEROLF, J. A. BABBITT, DAVID HUSIK, and LEWIS FISHER—3. Otolaryngology.

MISERICORDIA HOSPITAL

Tuesday

JOHN E. LOFTUS—2. Otolaryngology.

Wednesday

C. T. MCCARTHY—2. Otolaryngology.

HAROLD GOLDBERG—3. Ophthalmology.

Thursday

JOHN E. LOFTUS—2. Otolaryngology.

JOHN A. COLGAN—3. Opthalmology.

Friday

C. T. MCCARTHY—2. Otolaryngology.

POLYCLINIC HOSPITAL

Tuesday

T. B. HOLLOWAY—2. Ophthalmology.

Wednesday

WALTER ROBERTS—2. Otolaryngology.

E. B. GLEASON—3. Otolaryngology.

L. C. PETER—3. Ophthalmology.

Thursday

GEORGE B. WOOD—3. Laryngology.

RALPH BUTLER—3. Laryngology.

HAHNEMANN HOSPITAL

Tuesday

G. J. PALEN—2. Résumé of mastoid operation by otological department.

Thursday

H. S. WEAVER and C. B. HOLLIS—2. Nose and throat clinic.

Friday

F. O. NAGLE—2. Eye clinic. Pathology of the eye.

ST. AGNES HOSPITAL

Tuesday

BENJAMIN D. PARISH—2. Otolaryngology.

Wednesday

WARREN B. DAVIS—2. Otolaryngology.

GEORGE F. J. KELLY—2. Ophthalmology.

METHODIST EPISCOPAL HOSPITAL

Tuesday

WALTER ROBERTS—2. Deviated septum, tonsillectomies and adenoidectomies, mastoid disease and malignant disease of the larynx, bronchoscopy.

PHILIP H. MOORE—4. Enucleation, foreign body in the eye, strabismus, glaucoma.

JEFFERSON HOSPITAL

Thursday

FIELDING O. LEWIS—2. Otolaryngology.

Friday

HOWARD F. HANSELL and WILLIAM M. SWEET—2. Ophthalmology.

S. MACCUEN SMITH and J. CLARENCE KEELER—2. Otology.

COOPER HOSPITAL (Camden)

Tuesday

L. B. HIRST, E. R. HIRST, and ALFRED ELWELL—2:30. Otolaryngology.

Thursday

L. B. HIRST, E. R. HIRST, and ALFRED ELWELL—2:30. Otolaryngology.

WOMAN'S HOSPITAL

Tuesday

LAURA E. HUNT and MARY HIPPLE—2. Otolaryngology.

Wednesday

MARGARET A. WARLOW—1:30. Otolaryngology.
MARY BUCHANAN—2. Ophthalmology.

Thursday

MARGARET F. BUTLER and LOUIS VAN LOON—2. Otolaryngology.

SAMARITAN HOSPITAL

LUTHER C. PETER—Tuesday, 4. Ophthalmology.

CHILDREN'S HOMEOPATHIC HOSPITAL

FRED W. SMITH—Tuesday, 2. Laryngological clinic, hypertrophied tonsils and adenoids.

STETSON HOSPITAL

CARLE L. FELT and associates—Wednesday, 1. Otolaryngology.

MT. SINAI HOSPITAL

Tuesday

L. FISHER—2. Tonsil and sinus surgery. Bárány test.
C. W. LEFEVER—4. Cataract, glaucoma, muscle work.

Thursday

S. J. GITTELSON—2. Demonstration of cases.

Friday

A. W. WATSON—2. Mastoid and tonsil surgery.

CHESTNUT HILL HOSPITAL

Wednesday

BENJAMIN PARISH and JOHN DAVIES—2. Otolaryngology.

Thursday.

CARL WILLIAMS—2. Ophthalmology.

CHILDREN'S HOSPITAL

Wednesday

H. MAXWELL LANGDON and A. R. RENNINGER—2. Ophthalmology.

Thursday

JAMES A. BABBITT and staff—2. Otolaryngology.

PRESBYTERIAN HOSPITAL

H. MAXWELL LANGDON and staff. Ophthalmology.
N. P. STAUFFER and staff. Otolaryngology.

NORTHEASTERN HOSPITAL

Wednesday

GEORGE E. SHAFFER—2. Caldwell-Luc operation.
GRANVILLE A. LAWRENCE—4. Ophthalmology.

WOMEN'S HOMEOPATHIC HOSPITAL

JOSEPH F. V. CLAY—Thursday, 2. Otolaryngology.

PHILADELPHIA GENERAL HOSPITAL

DAVID N. HUSIK—Friday, 2. Otolaryngological operations.

PHILADELPHIA HOTELS AND THEIR RATES

	Minimum Rate for Room with Bath	
	Single	Double
Adelphia, Chestnut and 13th Sts	$4.00	$8.00
Bellevue-Stratford, Broad and Walnut Sts	5.00	8.00
Benjamin Franklin, Chestnut and 9th Sts	3.00	6.00
Green's, 8th and Chestnut Sts	3.50	5.00
Longacre, Walnut St. West of Broad	4.00	6.00
Lorraine, Broad St. and Fairmont Ave	2.50	5.00
Majestic, Broad St. and Girard Ave	4.00	5.00
Robert Morris, 17th and Arch and the Parkway	3.00	5.00
Pennsylvania, Chestnut and 39th Sts	3.00	6.00
Rittenhouse, Chestnut and 22nd Sts	3.50	5.00
Ritz-Carlton, Broad and Walnut Sts	6.00	10.00
Spruce (Men only), Spruce and 13th Sts	4.00	.....
St. James, Walnut and 13th Sts	3.50	5.00
Stenton, Broad and Spruce Sts	5.00	7.00
Sylvania, Locust and Juniper Sts	4.00	6.00
Walton, Broad and Locust Sts	3.00	5.00

A. J. Ochsner

MEMOIR—ALBERT J. OCHSNER

UNDER the whispering pines of a country cemetery on Honey Creek, Sauk County, Wisconsin, the mortal remains of Dr. Albert J. Ochsner were laid to rest July 28, 1925.

Dr. Ochsner was a descendant of Wisconsin pioneers from near Zurich, Switzerland. His grandfather and father opened up a new country and made a home for themselves. Dr. Ochsner was educated in the country schools near his home and in the University of Wisconsin, where in 1884 he took the degree of Bachelor of Science as honor man of his class, having done the four years' work in three years. He was greatly interested in microscopy, which was then a comparatively new subject. His every inclination toward medicine, he was graduated from Rush Medical College in 1886, and spent the next two years in graduate study abroad. He received his first surgical inspiration from the late Dr. Moses Gunn, a striking figure in surgery in the early days in Chicago. Ochsner's knowledge of the microscope led to a position as instructor in histology at Rush Medical College. On the death of Gunn, Dr. Charles T. Parkes, professor of anatomy at Rush, took the chair of surgery, and Ochsner became his first assistant and chief of clinics. When Parkes died, Dr. Nicholas Senn took the chair of surgery, and for five years Ochsner served as his chief of staff. Ochsner, a tireless student, was one of a group of brilliant young men who surrounded Christian Fenger, who at that time was entering into his deservedly great reputation in surgical pathology.

In 1891, the original Augustana Hospital of about twenty beds, housed in a small frame building on the site of the present Augustana Hospital of 246 beds at the corner of Garfield Street and Cleveland Avenue, Chicago, needed a chief surgeon, and the place was given to Ochsner, whose extraordinary ability as diagnostician, operator, and teacher quickly made the hospital one of the most notable institutions in Chicago. I became acquainted with Ochsner while he was acting as assistant to Senn, and from the beginning was an interested and admiring observer of his work in the building of a great surgical clinic.

Few men of Dr. Ochsner's generation have equaled him in contributions to the science and art of surgery. The almost intuitive readiness with which he grasped important general surgical principles was one of his most striking characteristics. A fearless crusader for the truth, he was so far in advance of his time and so little interested in attracting attention to himself, that his name is not associated with many of his greatest contributions.

In the early days in Chicago, milk infected by the bovine bacillus of tuberculosis caused a great variety of tuberculous processes, especially in young persons. Tuberculous glands of the neck at that time were called scrofula, and patients were subjected to extensive dissections for their removal. Ochsner, after removing tuberculous glands, would thoroughly remove the tonsils, through which he believed that most of such infections came. At that period the direct relationship of the bacillus of tuberculosis to scrofulosis was not generally recognized.

Early in Ochsner's clinic it became the usual thing to see him with tooth forceps and root extractor clear up the septic mouths of his patients after operations, because he believed that rheumatism and many other forms of disease might have their origin in bad teeth. He had an arrangement with one of the dental schools whereby the poor patients of his clinic were later given the necessary dental reconstruction attention.

In the early days of our knowledge of the treatment of hernia, Ochsner used the non-operative procedure with young children of raising the foot of the bed to keep the intestines out of the hernial sac and noted how quickly the average patient was thereby cured. He was the first to point out that in cases of femoral hernia, if the sac was thoroughly freed, ligated, and dropped back, sutures were unnecessary, because the circular opening would heal to the center if it was not disturbed. He said that the certainty of cure of femoral hernia was in inverse proportion to the length of time consumed in the operation. An operation lasting an hour would usually fail, while one lasting from five to ten minutes would nearly always succeed.

The surgical condition with which Ochsner's name was most closely associated was appendicitis, or rather the treatment of acute spreading septic peritonitis, the result of acute perforating appendicitis. Ochsner early pointed out that sufficient distinction was not made between perforating appendicitis and its resultant septic peritonitis. He showed that to remove an appendix which had done its deadly work, in the face of an active, spreading, septic peritonitis, often did more harm than good. He made evident that the great factor in tiding the patient over an acute spreading peritonitis was to give nothing by stomach for a few days, in order to stop the spread of the infection by means of intestinal peristalsis, and to supply the patient with water by proctoclysis or hypodermoclysis to maintain adequate elimination.

Ochsner was a man without vanity. He was intensely interested in surgery, faithfully attending medical society meetings, reading papers, and participating in discussions. He was the author of a number of valuable treatises on surgery. He received just recognition from universities, both at home and abroad. He was a member of the Board of Regents of the American College of Surgeons from its inception, the president of the College in 1923, the president of the American

Surgical Association in 1924, and for twenty-five years, from 1900, professor of clinical surgery in the University of Illinois Medical Department.

But why recapitulate these scientific activities which are so well known to all? As my lifelong friend, my companion in traveling both at home and abroad, it is Ochsner, the man, of whom I wish to speak. Honest, sincere, kindly, I never knew him to say a word or do an act that little children might not have heard or seen. An instinctive courtesy and consideration for others, and charity under all circumstances, were his most conspicuous traits. A man of strong convictions and independent thought, he always conceded the same rights to others. He was interested in young men in medicine, and supported and helped to educate a group of grateful students.

In the death of Ochsner I feel a great personal loss which words fail me to express. Spiritually, morally, and professionally, I profited greatly from my association with him. Tribute had been paid Dr. Ochsner in universal expressions of regret, and in expressions of sympathy to his family, especially to his wife, who labored faithfully by his side for more than thirty years.

A gallant soul has passed from us. His memory will be a sacred heritage to those who had the privilege of knowing him. WILLIAM J. MAYO.

AN APPRECIATION

IN the death of Albert J. Ochsner, the American College of Surgeons shares with the whole medical world an irreparable loss. He was the first president of the Clinical Congress; one of the Founders and a past-president of the College, its treasurer and constant supporter and counsellor from its inception, and one of the Editorial Staff of this, its official Journal.

Ochsner typified strength in every phase of his intellectual and physical being. One must have known him and have appreciated his character to understand how a man who so consistently shunned the spectacular, and who possessed his inherent modesty, could attain his eminence and wield his influence in the medical profession and in civic society. The great balance of this man of gigantic accomplishments was his force of character, supported by a strong physique and a keen intellect, which never were impaired or confused by dissipation. His heritage afforded an adequate background which was refined by educational advantages, and at the very outset he proved himself a man of vision and of scientific force, as evidenced by his thesis on microscopical investigations in embryology, based on work which he had done while an undergraduate student, which won for him a Fellowship in the Royal Microscopical Society. To his natural advantages he added untiring industry, unyielding perseverance, unerring judgment,

and unimpeachable honesty; he was devoted to his profession, had a personal interest in his associates and patients, lent his enthusiastic support to professional and lay societies, and was a lover of Art—pictures, sculpture, and music.

Ochsner, with his pleasing personality and his love of peace, was an uncompromising foe of all kinds of hypocrisy in living and unethical shifting in the profession. With his scientific mind tuned to accuracy, he was utterly unappreciative of the subtlety of creeds; yet all of his life he worked harmoniously and sympathetically in hospitals controlled by people of the strongest beliefs; and in his personal contact with peoples of all creeds, especially the poor and the helpless, his attitude was that of the Master Himself. The Golden Rule was his guiding principle.

The epoch-making anti-fee-splitting pledge of the American College of Surgeons was written by Doctor Ochsner, and he defended it with strong arguments and was in the forefront in the uncompromising enforcement of it. It is the Sermon on the Mount in medicine of the present and for the future, its meaning is unmistakable, and its language is not obscured by ornamentation.

The presidential gown of the American College of Surgeons, in which Doctor Ochsner was laid to rest, was placed upon him by Mrs. Ochsner, who said it was her feeling that this was a fitting tribute to the College in view of Doctor Ochsner's love for, and pride in, the organization.

FRANKLIN H. MARTIN.

Doctor Ochsner was born at Baraboo, Wisconsin, on April 3, 1858; son of Henry and Judith (Hottinger) Ochsner. B.Sc., University of Wisconsin, 1884, LL.D. 1909; M.D., Rush Medical College, 1886; interne, Presbyterian Hospital, 1886–1887; Post-Graduate courses, Universities of Vienna and Berlin, 1887-1888. Married Marion H. Mitchell, of Chicago, April 3, 1888. Children, Albert Henry and Bertha. Practiced in Chicago 1889–1925; instructor in surgery, Rush Medical College, 1889–1895; professor of clinical surgery, University of Illinois, College of Medicine, 1900–1925; chief surgeon, Augustana Hospital, 1891–1925, and St. Mary's Hospital, 1896–1925. Spent two weeks of every three months at various surgical clinics in the United States, 1895–1907. First Lieutenant, U. S. Medical Reserve Corps, 1908–1916; Major, U. S. Medical Reserve Corps, 1916; on active duty during late war. President, Clinical Congress of Surgeons of North America, 1910–1912; Founder of American College of Surgeons, Regent and Treasurer, 1913–1925, President, 1923–1924; Fellow, American Surgical Association (President, 1924); member, Southern Surgical and Gynecological Society, American Medical Association (Chairman, Surgical Section, 1901), Illinois State Medical Society; Chicago Medical Society, Chicago Pathological Society, Chicago Surgical Society, International Society of Surgeons; Fellow, Royal Microscopical Society of England; Honorary Fellow, Royal College of Surgeons in Ireland; Honorary Member, National Academy of Medicine of Mexico, National Surgical Society of the Republic of Switzerland, and Medical Society of Stockholm. Member of Editorial Staff, SURGERY, GYNECOLOGY AND OBSTETRICS. Author: Handbook on Appendicitis (1st edition 1902, 2d edition 1906); Clinical Surgery for the Instruction of Practitioners and Students (1st edition 1902, 2d edition 1905, 3d edition 1912); Thyroid and Parathyroid Glands, 1910; Yearbook on Surgery, 1917–1925; Surgery of the Thyroid Gland; Treatise on Surgical Diagnosis and Treatment, 1918; Organization, Management, and Construction of Hospitals (1st edition 1907, 2d edition 1913); and many monographs on surgical subjects.